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THE MOTHS OF INDIA

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6. Miresa metathermistis.
7. Arbela campbelli.
8. Phalera ochropis.
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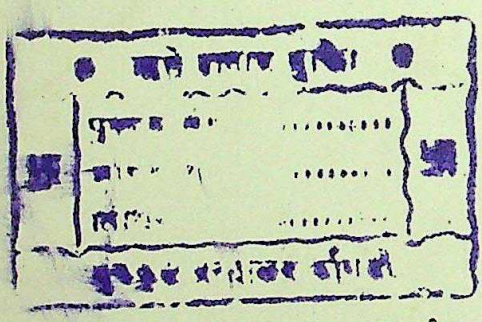

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ERRATA AND ADDENDA.

VOLUME XIX.

Page 30, line 34, for *Loranthaceæ* read *Laurineæ*.

,, 34, ,, 6, *for* it *read* this butterfly.

Coloured Plate F, Fig. 39. The butterfly figured is *Ypthima baldus*, Fabricus, and not *Y. philomela*, Johannsen, as stated. *Y. baldus* is said to be found in the Himalayas from Chumba to Sikhim and Bhutan; Bengal; Central, Western and Southern India; Assam; Cachar, Burma and Tenasserim. *Y. philomela* has no sub-basal transverse fascia on the underside of the forewing and the striæ are not as coarse as in *Y. baldus*.

VOLUME XX.

Page 74, line 8, *for* 19 *read* 17.

,, 105, ,, 20, for *Cochracea* read *Ochracea*.

,, 131, ,, 13, ,, *lencocyma* read *leucocyma*.

,, 134, No. 21, ,, *L. ishana* read *L. isana*.

,, 135, ,, 31, ,, *coalpara* read *goalpara*.

,, 137, ,, 70, ,, *arpisatis* read *parisatis*.

,, 137, ,, 73, ,, '*Parhestina persinilis Zella's*' read '*P. persimilis zella*.'

,, 139, line 1, ,, *yerburii* read *yerburyi*.

,, 140, ,, 13, *for* October *read* September.

,, 142, ,, 11, ,, Abissara *read* Abisara.

,, 194, ,, 41, for *phœnicureides* read *phœnicuroides*.

,, 249, ,, 6, *for* medicine *read* medium.

,, 249, ,, 11, ,, ,, ,, ,,

,, 252, ,, 38, for *Gunnomys* read *Gunomys*.

,, 253, ,, 11, ,, *Palœarnis* read *Palœornis*.

,, 256, ,, 19, ,, *sueicica* read *suecica*.

,, 256, ,, 35, ,, *coramandus* read *coromandus*.

,, 286, ,, 32, ,, *sparsersides* read *sparveroides*.

,, 292, ,, 35, *for* belonging.....in India *read* it is the "Common Purslane" of England and is often cultivated as a vegetable in Europe and Asia.

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Page 321, line 4, from the bottom *add* 74 before *Telchinia*.
,, 321, ,, 4, from the bottom for *Telchinis* read *Telchinia*.
,, 324, ,, 30, *add* 75 before *Libythea*.
,, 327, ,, 25, ,, 76 ,, *Abisara*.
,, 329, last line, *add* "The food plants of the larva are *Embelia robusta*, Roxb., a large climber in the moist forests of the Western ghats in Bombay, and *Ardisia solanacea*, Roxb., a shrub growing in similar situations throughout India, in China and Malay. The two plants both belong to the botanical family *Myrsineæ*."

Plate XIV, *after* Psammophis condanarus *for* poisonous *read* harmless.

Page 487, line 5, for *Mcyeri* read *Meyeri*.
,, 519, ,, 22, ,, *Ibidorynchus* read *Ibidorhynchus*.
,, 519, ,, 24, ,, ,, ,, ,,
,, 519, ,, 28, ,, ,, ,, ,,
,, 520, ,, 2, ,, ,, ,, ,,

Cover of part II, line 3, for *Ibidorynchus* read *Ibidorhynchus*.

Page 531, line 30, for *viscivarus* read *viscivorus*.
,, 536, ,, 12, ,, *spekie* read *spekei*.
,, 536, ,, 20, ,, *orix* read *oryx*.
,, 536, ,, 27, ,, *Cerivoula* read *Kerivoula*.
,, 536, ,, 28, ,, *hyperthia* read *hyperythra*.
,, 536, ,, 34, ,, *hymalayan* read *hymalayana*.
,, 537, ,, 26, ,, *Coocystes* read *Coccystes*.
,, 538, ,, 5, ,, *glandarious* read *glandarius*.
,, 539, ,, 18, ,, *Cyon* read *Cuon*.
,, 623, ,, 6, ,, *Pterocercus* read *Pherocercus*.

Pages 625, & 633, the descriptions of the plate should be reversed, the one on page 625 being intended for *P. condanarus* and that on page 633 being that of *T. stolatus*.

Page 752, line 6, *for* name *read* mane.

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Austria, H. I. H. the Archduke Franz Ferdinand (Life Member)	... *Europe.*
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Bacon, A. L.	... Mogok.
Bagnall, Lieut. R. ...	... Lucknow.
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Baker, P. M. (B.Sc., A.M.I.M.E., A.M.I.E.E.)	... Bombay.
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Ballantine, W. J. H.	... Hafflong, N. Cachar Hills.
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Barkley, Mrs. L. G. M.	... *Europe.*
Barlee, K. W. (I.C.S.)	... Bombay.
Barlow-Poole, B. H. (I.F.S.)	... Kurnool.
Barnes, L. H.	... Rutlam.
Barnett, Capt. W. H.	... Mandalay.
Barnett, W. G.	... Saugor, C. P.
Baroda, H. H. the Maharaja Sir Sayaji Rao Gaekwar of (G.C.S.I.) (Life Member) ...	... Baroda.
Barrett, Capt. F. W.	... Lucknow.
Barrington, A. H. M., (A.G.F.) ...	... Rangoon.
Barrow, Col. H. J. Waller (R.A.M.C.) ...	... *Europe.*

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Barton, C. S.	... Burma.
Barton, E. L. (Life Member)	... *Europe.*
Bateman, C.	... Jalpaigoorie.
Batten, C. Clifford...	... Mussoorie.
Battie, J. S. (I.F.S.)...	... Chittoor.
Battye, Major W. R. (I.M.S.)... ...	... Udaipur, Rajputana.
Baumbach, R.	... Pachmarhi, C. P.
Baxter, N. B.	... Dhulia.
Bayley, Hon'ble Sir Chas. (KT., I.C.S., K.C.S.I.)	... *Europe.*
Bayley, Major F. G.	... Meerut.
Beadnell, C. B.	... Calicut.
Beadon, W. R. C. (F.G.S.)	... Bombay.
Beale, H. F. (Life Member)	... Karachi.
Beamish, H. E.	... Mandalay.
Beaumont, T. L. F.	... Karachi.
Beazley, W. E.	... Malakand.
Beckett, R. H.	... Nagpur, C. P.
Beebe, C. William	... America.
Beechey, A. St. V. (I.F.S.)	.. Balaghat, C. P.
Beet, A. C. (I.C.S.)	... Nimar.
Beg, Mirza Nazir	... Nander, Hyderabad (Deccan).
Begbie, Major A. S.	... *Europe.*
Bell, C. F. (I.F.S.)	... Khandwa.
Bell, E. N. (I.C.S.)	... Myingyan, Burma.
Bell, H. F. E. (I.C.S.)	... Jubbulpore, C. P.
Bell, Dr. L. H. I.	... Hubli, S. M. R.
Bell, R. D. (I.C.S.)	... Bombay.
Bell, T. R. (I.F.S.)	... Belgaum.
Bell, W. M.	... Bombay.
Bellairs, R. G.	... Kumaon, U. P.
Bennett, Douglas	... Bombay.
Bennett, H. C. (I.F.S.)	... Chatrapur.
Benson, Miss A. M. (M.D.)	... Bombay.
Bentley, Dr. Charles (M.B.)	... Bengal.
Berhampur, Krishnath College, The Principal	... Berhampur.
Bernard, Col. H. C.	... Nasirabad.
Berne, Capt. J. G. (R.A.M.C.)... ...	... *Europe.*
Bernhardt, K.	... *Europe.*
Berthon, Major H. W.	... Bombay.
Best, The Hon'ble James W. ...	... Bilaspur, C. P.
Betham, J. A.	... *Europe.*
Betham, Lt.-Col. R. M.	*Europe.*
Betham, W. G. (I.F.S.)	... *Europe.*
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Beynon, F. C. ... ... Kasauli.
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Bhatavadekar, Sir Bhalchandra Krishna, Kt. ... Bombay.
Bhatia, G. R. ... ... Gonda.
Bhownagar, H. H. the Maharaja Sir Bhaosingji Takht Singji of (G.C.S.I.) (Life Member) ... Bhownagar.
Bhurie Singh, H.H. Sir (K.S.C.I., C.I.E.) (Life Member) Chamba.
Biggie, H. W. ... ... Dera Ismail Khan.
Biggs, Col. H. V. (R.E.) ... ... Murree.
Bijawar, H. H. the Maharaja Sawai Sawant Singh Bahadur... ... ... Bijawar, C. I.
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Bird, Major R. (I.M.S.) ... ... Calcutta.
Birrell, Miss B. ... ... Simla.
Biscoe, W. Fraser (I.F.S.) ... ... Indore, C. I.
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Bishop, Dr. T. H. ... ... Paksey, Eastern Bengal.
Bisset, Capt. E. (I.M.S.) ... ... Bannu.
Blackwood, J. F. ... ... Jalpaiguri.
Blackwood, N. O'Reilly ... ... Secunderabad.
Blake, A. A. ... ... Chapra, Saran.
Blanford, Capt. C. E. (R.A.) ... ... Kohat.
Blanford, H. R. (I.F.S.) ... ... Rangoon.
Blascheck, Hans ... ... Bombay.
Blathwayt, C. H. (I.C.S.) ... ... Mirpurkhas.
Blatter, Revd. E. (S.J.) ... ... *Europe.*
Blunt, H. R. ... ... Srinagar.
Boalth, V. H. ... ... Lahore.
Bock, F. von ... ... Nasik.
Bogle, Capt. J. S. ... ... Mardan.
Boles, D. C. ... ... Saugor, C. P.
Bolitho, E. W. (R.F.A.) ... ... Neemuch.
Bolster, R. C. (I.C.S.) ... ... *Europe.*
Bomanji, K. R. (I.C.S.) ... ... Dhulia.
Bombay Government, The Chief Secretary, Separate Department ... ... Bombay.
Bombay Veterinary College, The Principal ... Bombay.
Bomford, Rev. Trevor (M.A., C.M.S.) ... ... Amritsar.
Book Club, Hon. Secy., 67th Punjabis ... Multan Cant.
Boothe, E. ... ... Bombay.
Boughey, G. M. (I.C.S.) ... ... Simla.
Bourchier, E. F. G. ... ... Peshawar.
Bourke, D. R. S. ... ... *Europe.*
Bowden, H. F. ... ... *Europe.*

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Boxall, E. A.	... Lakon, U. Siam.
Boxwell, Capt. A.	... Bangalore.
Boyd, C. C. (I.C.S.)...	.. Ahmednagar.
Boyd, J. E. M. (R.A.M.C.)	... Ferozepore.
Boyle, D. H. M.	... Rangoon.
Bracken, G. P. A. (R.A.M.C.)	... Trimulgherry.
Bradshaw, J. P.	... Bombay.
Brady, W. H.	... Bombay.
Brandon, J. A.	... Bombay.
Branford, R.	... Punjab.
Branson, R. M.	... Bombay.
Brassey, Capt. L. P.	... *Europe.*
Brendon, B. A. (I.C.S.)	... Belgaum.
Bridgeman, Lt. The Hon. H. G. O. ...	... Rawalpindi.
Bridgeman, Lt. Comdr. The Hon. R. O. B.	... *Europe.*
Bright, Geo. E. (C.E.)	... Bombay.
Briscoe, P. C.	... *Europe.*
Brodie, D.	... Calicut.
Brodie, N. S. (I.C.S.)	... Chittoor, N. Arcot.
Bromley, T. E. (I.C.S.)	... Nimar.
Brook-Fox, E. (C.E.)	.. Jamalpore.
Brooke, A. F.	... Ambala.
Brooke, A. S.	... Ferozepore.
Brooke, R. H.	... Bombay.
Broughton, Capt. T. D. (R.E.)... ...	... Malta.
Brown, Major H. R. (I.M.S.)	... Bangalore.
Brown, Prof. R. S. C. (B.S.C.) ...	... Poona.
Browne, A. A.	... Bombay.
Browne, D. R. H.	... Shikarpur.
Browning, G. E. (M.I.C.E.)	... Trichoor.
Brownlow, C. C.	... *Europe.*
Brymer, W. H.	... Panniar Bridge, P. O., S. India.
Budd, Lt.-Col. N. A. H.	... Bolarum Deccan.
Bulkley, E. B. M.	.. Sabathu.
Bulkley, H. G.	... Thana.
Bulkley, W. W.	.. *Europe.*
Bull, E. H.	... Hoogrijan, P. O.
Burd, Capt. E. (I. A.)	... Rangoon.
Burd, P....	... Itakhola, P.O. Sylhet
Burder, H. C. (Life Member)	... *Europe.*
Burke, H. F. (R.A.)	... Bungi Gilgit.
Burkill, I. H. (M.A.)	... Calcutta.
Burn, J. G. (I.C.S.)	... *Europe.*
Burne, Capt. L. E. L.	... Falam, Chin Hills.
Burnett, Prof. K.	... Hyderabad, Deccan.
Burnett. R. H.	... Sholapur.

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Burns, C. L ... ... Bombay.
Burns, W. ... ... Poona.
Burt, E. H. ... ... *Europe.*
Burton, Lt.-Col. R. G. ... ... *Europe.*
Burton, Major Richard W. ... ... Meerut.
Bury, Charles H. ... ... Chakrata.
Busch, H. F. ... ... Bombay.
Butcher, A. ... ... Behali P. O., Assam.
Butler, A. L. ... ... *Europe.*
Butler, Capt. H. M. ... ... Santa Cruz.
Butler, S. G. ... ... Assam.
Butterworth, G. S. ... ... *Europe.*
Buxton, Rev. H. J.... ... ... Rangoon.
Byculla Club, The Hon. Secretary ... ... Bombay.

Cabell, W. H. L. (I.C.S.) ... ... Bhamo, Burma.
Caccia, A. M. (I.F.S.) (Life Member) ... ... *Europe.*
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Calder, H. ... ... Rangoon.
Calder, N. ... ... Lucknow.
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Cama, Dr. Maneckjee D. (M.D.) (Life Member) ... Bombay.
Cambridge University Museum of Zoology, the... *Europe.*
Superintendent.
Cameron, I. M. ... ... Bengal.
Cameron, Thos. H. ... . Quilon, Travancore.
Cameron, Hon'ble Mr. W. L. (C.E., C.S.I.) ... *Europe.*
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Campbell, A. S. ... ... Jalgaon.
Campbell, R. G. ... ... Bombay.
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Channer, Capt. Kendall ... ... Almora.
Channer, G. O. de R. ... ... Quetta.
Chanter, E. ... ... Rangoon.
Chapman, W. H. ... ... Karachi.
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Chesney, H. G. ... ... Fort Sandeman.
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Childers, H. F. E. ... ... Burma.
Chippindall, H. G. (R.E.) ... ... Ferozepore.
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Clarke, Robt. L. H. (I.C.S.) ... . Orai, Jalaun Dist.
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Colomb, Lt.-Col. R. P. ... ... Nagpur, C. P.
Colombo Museum, The Librarian ... ... Colombo.
Colston, Capt H. K. ... ... Quetta.
Coltart, Dr. H. N. (Life Member) ... ... Darbhanga, T.S.Ry.
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Cook, J. Pemberton ... ... Burma.
Cooke, E. B. ... ... Bina.
Cooper, Major P. T. (R.A.) ... ... Allahabad.
Cooper, R. W. ... ... Karachi.
Cooper, T. ... ... Bandikui.
Coote, M. C. ... ... *Europe.*
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Corbett, Capt. W. F. ... ... *Europe.*
Cordue, Lt.-Col. W. G. R. (R.E.) ... ... *Europe.*
Cosens, F. R. ... ... Colombo, Ceylon.
Cosens, Lt. G. P. ... ... Muttra Cant.
Cosserat, L. (C.E.) ... ... Broach.
Cotton, C. W. E. (I.C.S.) ... ... Madras.
Cotton, W. B. (I.C.S.) ... ... *Europe.*
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Coutts, W. S. ... ... Chittagong.
Coventry, B. O. (I.F.S.) ... ... *Europe.*
Covernton, Professor A. L. ... ... Bombay.
Cowie, Rev. A. G. G. (Life member) ... ... Rawal Pindi.
Cowie, W. P. (I.C.S.) ... ... Jalgaum.
Cox, C. E. C. (F.Z.S.) ... ... Hoshangabad, C.P.
Cox, Col. P. Z. (F.Z.S., F.R.G.S., C.I.E.) ... ... Bushire.
Cox, S. (I.F.S.) ... ... Ootacamund.
Craddock, W. H. (I.F.S.) ... ... Rangoon.
Craig, C. W. ... ... Lahore.
Craw, H. H. ... ... Rangoon.
Crawford, F. L. ... ... Akola, Berar.
Crawford, Leslie ... ... *Europe.*
Crawford, W. L. ... ... Saklaspur, Hassan.
Crawford, W. M (I.C.S.) ... ... Sambalpore.
Crerar, J. (I.C.S.) ... ... *Europe.*
Croly, A. E. J. ... ... *Europe.*
Cross, H. E. ... ... Muktesar.
Cross, R. G. ... ... Daloo P.O., Cachar.
Cruikshank, W. D.... ... ... Bharatpur Agency.
Cruickshank, A. H. P. ... ... Lahore Cantt.
Crum, W. E. ... ... Calcutta.
Cubitt, G. E. S. (I.F.S.) ... ... *Europe.*

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Cuffe, T. W. ... ... England.
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Cumming, J. W. N. ... ... Quetta.
Cummings, Col. W. H. (R.G.A.) ... ... *Europe.*
Cunningham, Capt. J. ... ... *Europe.*
Currie, A. J. ... ... Lahore.
Currie, M. M. L. (I.C.S.) ... ... Ferozepore.
Currimbhoy Ebrahim, Sir, Bart. ... ... Bombay.
Currey, E. S. ... ... *Europe.*
Currey, Capt. V. F. ... ... Malta.
Cursetji, Khan Bahadur C. M. (Life Member) ... Bombay.
Cutch, H. H. Sir Shri Kengurji Sawai Bahadoor, the Rao Saheb of (G.C.I.E.) (Life Member) ... Bhuj, Cutch.

D'Abreu, E. A. ... ... Nagpur.
D'Albedyhll, C. C.... ... ... *Europe.*
Dalgliesh, G. ... ... *Europe.*
Dallaporta, J. N. ... ... Bombay.
Dalrymple-Hay, Mrs. L. ... ... *Europe.*
Daly, The Hon'ble Col. Hugh (C.S.I.) ... ... Mysore.
Daly College, The Librarian ... ... Indore, C. I.
Dames, Felix L. ... ... Germany.
Daniell, Col. A. C. (R.A.) ... ... *Europe.*
Danson, J. W. W. ... ... *Europe.*
Darjeeling, The Vice-President, Natural History Museum ... ... Darjeeling.
Dastur, J. F. ... ... Pusa, Bengal.
Datia, H. H. the Maharaja Lokendra Govind Singh, Bahadur ... ... Datia, C. I.
Davidson, J. ... ... *Europe.*
Davidson, Norman ... ... Thazi, Burma.
Davidson, H. M. M. ... ... Behali P. O. Assam.
Davies, H. J. (F.G.S.) ... ... Burma.
Davis, J. W. G. ... ... Mandla, C. P.
Davis, W. S. ... ... *Europe.*
Dawkins, C. G. E. (I.F.S.) ... ... Pyinmana, Burma.
Dawson, W. G. ... ... *Europe.*
Dawson, W. H. (I.C.S.) (Life Member) ... ... *Europe.*
Deakin, Mrs. M. E. ... ... Bombay.
Deane, Dr. A. H. ... ... *Europe.*
Deane, H. H. (C.E.) ... ... Bombay.
Deane, N. B. ... ... Rangoon.
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Dhunjibhoy Bomanji (Life Member) ...	... Bombay.
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Dunn, C. W. (I.C.S.)	... Rangoon.
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Dunsterville, Lt.-Col. L. C.	... Jhelam.
Durie, G. A.	... Pegu, Burma.
Durie, T. E. (R.F.A.)	... Bangalore.
Dutt, H. L.	... Sabour, E. I. Ry.
Duxbury, Capt. C. D.	... *Europe.*
Dwane, E. H.	... Secunderabad.
Dwane, F. C.	... Yellandu, Deccan.
Dwane, Major J. W.	... *Europe.*
Dwane, H. M.	... Madras.
Dyer, Lt.-Col. R. E.	... Multan.
Dyson, Lieut.-Col. T. E. (I.M.S.) ...	... Poona.
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Edwards, W. N.	... Majuligarh, Assam.
Egerton, B. (C.I.E.)...	... Hyderabad, Deccan.
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Evans, Evan	... Planters' Stores, Dibrugarh, Assam.
Evans, Geoffrey (B.A.)	... Hoshangabad, C.P.
Evans, T. M.	... Bombay.
Evans, Lt.-Col. G. H. (I.C.V.D., F.L.S.)...	... Simla.
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Evans, Capt. W. K.	... Kamptee, C. P.
Evershed, John	... Kodaikanal.
Everard, L. E. C.	... Mongnai, S. Shan States.
Fagon, Capt. B.	... Imphal, Manipur.
Fagan, H. R.	... Rangoon.
Falkiner, Dr. J. M....	... Dibrugarh, Assam.

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Farmer, E. J. (I.C.S.)	... Lashio.
Farr, E. T. C.	... Ceylon.
Farrel, R. C. (I.F.S.)...	... Aurangabad.
Farrington, Sir H. A., Bart. (I.F.S.) ...	... Port Blair, Andamans.
Fatehsingrao of Akalkote, H. H. Raja ...	... Kirkee.
Fayrer, Major F. D. S. (I.M.S.) ...	... Bombay.
Fellowes, Capt. H. Le M.	... Lucknow.
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Foster, Capt. R. T.	... *Europe.*
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Foulkes, Major T. H. (I.M.S.) (Life Member)	... Madras.
Fountaine, Miss M. E. (F.E.S.) ...	... *Europe.*
Fowle, F. C.	... Bombay.
Fowler, H.	... *New York, U.S.A.*
Fox, J. H. Manning	... Barrackpore.
Francis, R. F.	... Jullundur.

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Page 797, line 31, for *clakistone* read *blakistoni*.
,, 845, ,, 28, ,, *vindhina* read *vindhiana*.
,, 883, ,, 19, ,, *Pericrotus* read *Pericrocotus*.
,, 889, title of Miscellaneous Note No. XLIV *for* "Curious Growth of the Palmyra Palm, Borassus flabellifer, Linn. *read* Palmyra Palm (Borassus flabellifer, Linn) Curiosities of Growth."
,, 890, line 6, for *Achridotheres* read *Acridotheres*.
,, 890, ,, 7, ,, *erithrorhynchus* read *erythrorhynchus*.
,, 892, ,, 10, *for* G.M. Ryan, F.Z.S., *read* G.M. Ryan, F.L.S.
,, 896, ,, 23, for *Cortunix* read *Coturnix*.
,, 896, ,, 24, ,, *coromandelisa* read *coromandelica*.
,, 896, ,, 25, ,, *Cortunix* read *Coturnix*.
Cover of part IV, line 6, *for* Blandford *read* Blanford.
,, ,, ,, ,, Miscellaneous Note No. XXII, for *juglandiper* read *juglandifer*.
Page 938, line 11, *for* in the day time *read* at night.
,, 955, ,, 31, for *gorrula* read *garrula*.
,, 957, ,, 1, ,, *smyrnesis* read *smyrnensis*.
,, 960, ,, 42, ,, *Peophron* read *Neophron*.
,, 961, ,, 9, ,, *Gypœtus* read *Gypaëtus*.
,, 961, ,, 16, ,, *chrysœtus* read *chrysaëtus*.
,, 968, ,, 41, ,, *coramandelica* read *coromandelica*.
,, 970, ,, 14, ,, *Porazana* read *Porzana*.
,, 1005, ,, 38, ,, *Temelia* read *Timelia*.
,, 1007, ,, 13, ,, *perigrinus* read *peregrinus*.
,, 1008, ,, 34, ,, *Gecinius* read *Gecinus*.
,, 1009, ,, 30, ,, *Frankalina* read *Franklinia*.
,, 1010, ,, 9, ,, *Palœornis* read *Palæornis*.
,, 1010, ,, 12, ,, *Hierœtus* read *Hieraëtus*.
,, 1010, ,, 25, ,, *Milvous* read *Milvus*.
,, 1010, ,, 29, ,, *apicaudus* read *apicicaudus*
Pages 1012 & 1013, for "*cindrella*" read "*cinderella*.
Page 1015, line 6, for *Pataurista* read *Petaurista*.
,, 1019, ,, 4, ,, *Birrel* read *Birrell*.
,, 1023, ,, 4, *for* (noneneed) *read* (nom : nud :)

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Page	1023,	line	10,	for	*nitidalus* read *nitidulus*.
,,	1023,	,,	10,	,,	,, ,, ,,
,,	1029,	,,	1,	,,	*Fells unica* read *Felis uncia*.
,,	1029,	,,	31,	,,	*Wooly* read *woolly*.
,,	1031,	,,	3,	,,	*Gazelle* read *Gazella*.
,,	1031,	,,	21,	,,	*Cervis* read *Cervus*.
,,	1046,	,,	last,	,,	*stoliezcæ* read *stoliczcæ*.
,,	1052,	,,	33,	,,	*melanosplia* read *melanospila*.
,,	1065,	,,	38,	,,	*gaucostigma* read *glaucostigma*.
,,	1115,	,,	9,	,,	*Papillionidæ* read *Papilionidæ*.
,,	1155,	,,	10,	*for*	a *read* or.
,,	1160,	,,	27,	for	*prosus* read *porosus*.
,,	1174,	,,	30,	,,	*humiæ* read *humiae*.
,,	1174,	,,	34,	,,	*whitheadi* read *whiteheadi*.
,,	1175,	,,	3,	,,	*unicoler* read *unicolor*.
,,	1175,	,,	10,	,,	*memoncola* read *nemoncola*.
,,	1175,	,,	13,	,,	*Pomatorkinus* read *Pomatorhinus*.
,,	1175,	,,	40,	,,	*Caccomantis* read *Cacomantis*.
,,	1184,	,,	5,	,,	*falconepi* read *falconeri*.
,,	1184,	,,	9,	,,	*fiimbriatus* read *fimbriatus*.
,,	1184,	,,	21,	,,	*scutulatus* read *scutulata*.
,,	1184,	,,	24,	,,	*Galinago* read *Gallinago*.
,,	1184,	,,	25,	,,	*solitaria* read *solitarius*.

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Gales, R. R.	... Calcutta.
Gale, B.	... Peshawar.
Gale, Capt. E. S.	... Maymyo.
Gallie, H. H.	... Rangoon.
Gammie, Prof. G. A.	... Poona.
Gardyne, Major A. D. G.	... Cawnpore.
Garrett, H. B. G. (I.F.S.)	... Bangkok.
Garrett, J. H. (I.C.S.)	... Nasik.
Garrett, R. S.	... Sirsa, Punjab.
Gaye, W. C.	... Secunderabad.
Gatherer, Capt. R. G. T.	... Bhamo, Burma.
Gebbie, F. St. G.	... Karachi.
George, C. P.	... Secunderabad.
Gerhardt, Paul	... Bombay.
Gervers, Capt. F. R. S.	... *Europe.*
Gharpurey, Capt. K. G. (I.M.S.) ..	... Bombay.
Ghosal, J. (I.C.S.)	... Ratnagiri.
Giberne, H. D.	... Mandalay.
Gibson, A. J. (I. F. S.)	... Kotgarh, Simla Dist.
Gibson, R. E. (I.C.S.)	... Hyderabad, Sind.
Gibson, W. R. (F.R.C.S., L.R.C.P.) ...	... Madras.
Gilbert, C. E. L. (I.F.S.)	... Bandra.
Gilbert, Reg. (F.Z.S.)	... *Europe.*
Gilbert-Cooper, W. J. (I.F.S.)... ...	... Kado, Moulmein.
Giles, A. R.	... Tezpur, Assam.
Giles. G. W.	... *Europe.*
Gill, Capt. C. A. (I.M.S.)	... Lahore, Punjab.
Gill, C. G.	... Amritsar.
Gillespie, Capt. R S. (R.E.)	... Chamba, Punjab.
Gillett, Capt. E. S. (A.V.D.)	... Matigiri, Salem Dist.

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Gillies, Capt. F. G....	... Secunderabad.
Gillum, S. J.	... Calcutta.
Gimlette, Lt.-Col. G. H. D. (C.I.E., I.M.S.)	... *Europe.*
Gimlette, Dr. J. D.	... Federated Malay States.
Girard, George	... Calcutta.
Girvin, Major J. (R.A.M.C.)	... Ahmednagar.
Gladstone, H. S. (F.Z.S., F.R.S.E.) ...	... *Europe.*
Glascock, L. C.	... Lahore.
Glasson, J. W. (I.C.S.)	... Godaveri, Madras.
Glazebrook, Hon. Mr. N. S.	... Bombay.
Gleadow, F. (F.R.M.S.)	... *Europe.*
Gloster, Capt. J. H. (I.M.S.)	... Bombay.
Godber, Rev. John	... Calcutta.
Godson, Capt. C. A. (I.M.S.)	... Assam.
Goldsmith, Dr. B. K.	... *Europe.*
Goldsmith, H. A.	... Bolarum, Deccan.
Gomberi, Rev. E. (S.J.)	... Trichinopoly.
Gonsalves, A. F.	... Bandra.
Gordon, D. M.	... Keng Tung, S. Shan States.
Gordon, K. L.	... Ceylon.
Gordon, R. G. (I.C.S.)	... Ahmedabad.
Gordon-Ralph, J. B.	.. *Europe.*
Gore, F. W.	... Hoogrijhan, Assam.
Gore, Col. St. G. C. (R.E., C.S.I.) ...	... *Europe.*
Goss, E. H. A.	... Shwebo.
Gough, Major C.	... Ahmednagar.
Gough, Major H. (I.A.)	... Quetta.
Gourjn, P. E.	... Berhampur.
Gover, A. A.	... Bangalore.
Gradon, A. F. (I.F.S.)	... *Europe.*
Grafton-Wignall, J. D.	... Rampore.
Graham, A. K.	... Karachi.
Graham, C. T.	... Rangoon.
Graham, D. N.	... England.
Graham, Capt. G. H. I.	... Chakdara.
Graham, J. A.	... Mercara, Coorg.
Graham, L. (I.C.S.)	... Bombay.
Graham, R. J. D. (M.A.)	... Nagpur, C. P.
Graham Roe, E. W.	... *Europe.*
Graham, Hon'ble Mr. W.	... Bombay.
Grant, F. A.	... Meiktila, Burma.
Gray, Chas.	... Coonoor.
Gray, John	... Rawalpindi.
Gray, P. B.	... *Europe.*
Greaves, Hon'ble Mr. H. R.	... Bombay.
Greaves, S. E.	... *Europe.*
Green, E. Ernest (F.E.S.)	... Ceylon.

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Green, James	... *Europe.*
Green, Lt.-Col. J. S. (R.A.M.C.) ...	... Nainital.
Greer, R. F. (I.C.S.)	... Rangoon.
Greer, W. (I.C.S.)	... Belgaum.
Gregory, R. V.	... Purna, Deccan.
Gregson, Capt. C. D.	... Bangalore.
Gregson, E. G.	... Peshawar.
Gregson, T. S.	... Bombay.
Greig, Capt. W. B.	... Belgaum.
Gribbon, M. C.	... *Europe.*
Grigson, T. S.	... Rangoon.
Grieve, F. C. L. (R.F.A.)	... Mhow, C. I.
Grönvold, H.	... *Europe.*
Gross, Carl	... Rangoon.
Grubbe, Major E. A.	... *Europe.*
Gulabrai Bhawandas	... Sind.
Gupta B. Sen	... Gairkatta P. O., Dooars.
Gupta, N. (BAR.-AT-LAW)	... Dacca.
Guyon, Capt. G. S.	... Trimulgherry.
Habibuddin, S. (N.C.S.) (Life Member) ...	... Hyderabad, Deccan.
Hacker, K.	... Mandalay.
Haeberle, Curt. (I.F.S.)	... *Europe.*
Haffenden, Ed. D. H.	... Rangoon.
Haig, Major N. W.	... Mhow.
Haigh, P. B. (I.C.S.)	... Karwar.
Hale, Major C. H. (R.A.M.C.)	... Secunderabad.
Hall, W. D.	... Bombay.
Hallaner, Martin	... Bombay.
Hamburg Natural History Museum ...	... Hamburg.
Hamilton, A. G.	... *Europe.*
Hamilton, J. D. (B.F.S.)	... *Europe.*
Hammond, A. H.	... *Europe.*
Hampson, Sir George F., Bart. (F.L.S., F.E.S.) ...	... *Europe.*
Hankin, A. C. (C.I.E.)	... Secunderabad.
Hannyngton, F. (I.C.S.)	... Calcutta.
Hannyngton, W. O.	... Shwebo, Burma.
Harcourt, Capt. J. S. M.	... *Europe.*
Hardie, Dr. Geo. W.	... Big Canjeeveram. S. India.
Hardy, G. S. (I.C.S.)	... Ratnagiri.
Harington, Major H. H.	... Mandalay, Burma.
Harington, Col. V. (I.M.S.)	... *Europe.*
Harker, O. Allen	... Dhulia.
Harper, E. W. (F.Z.S.)	... Africa.
Harris, Capt. O. M. (R.H.A.)	... Allahabad.
Harris, W.	... Dacca.

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Harrison, A. J.	... Lakhimpur, Assam.
Harrison, Major C. B. (I.M.S.) ...	... Madura.
Harrison, Major C. F.	... Rangoon.
Harrison, C. H. (I.C.S.)	... Camp, Punjab.
Harrison, R. T.	... England.
Harrold, W.	... Ahmedabad.
Hart, E. H.	... Lonavla.
Hart, G. S.	... Nagpur, C. P.
Harter, R. W.	... Bombay.
Harvey, Capt. W. F. (I.M.S.) ...	... Kasauli.
Hasted, Major A. W.	... Kasauli.
Hasted, H. R. G.	... Kurnool.
Hasted, J. E. H.	... Kistna.
Hasted, W. A.	... Palamcottah.
Hassels-Yates, Capt. G. A. (R.G.A.) ...	... *Europe.*
Hatchell, D. G.	... Madras.
Hate, Profr. Vinayek N.	... Bombay.
Haughton, H. L.	... Srinagar.
Haughton, Samuel	... *Europe.*
Hauxwell, T. A. (I.F.S.)	... Maymyo.
Hawkins, A. B.	... Digboi, Burma.
Hawley, Capt. W. G. B.	... Multan,
Hay, E. Alan	... *Europe.*
Hay, Capt. G. W.	... *Europe.*
Hayden, H. H.	... Calcutta.
Haymes, Capt. R. L. (R.A.)	... Singapore.
Hazlewood, Miss M.	... Rangoon.
Hearn, E. S.	... Meerut.
Headlam, Lt. E. James	... Rangoon.
Hearsey, C. H.	... Burma.
Hearsey, T. N. (I.F.S.)	... Coimbatore.
Heath, H. A.	... Horawala, Ceylon.
Heath, R. H. (C.E.)	... Ahmedabad.
Hector, G. P. (M.A., B.SC.)	... Dacca.
Heeckerenz, Baron Von (Hon. Corres. Member)	... *Europe.*
Hemans, Capt. G. W.	... Bolarum, Deccan.
Henderson, Capt. H. D.	... Imphal, Manipur.
Henderson, Capt. R. R.	... *Europe.*
Henderson, G. S.	... *Europe.*
Henderson, W. L.	... Rangoon.
Hepburn, W.	... *Europe.*
Herbert, H. P.	... Trevandrum.
Herbert, V. A.	... Allahabad.
Heron, F. A.	... Punjab.
Heseltine, Capt. G....	... *Europe.*
Heseltine, Capt. J. E. N.	... Jubbulpore, C. P.
Hewetson, Major A. W. (R.F.A.) ...	... *Europe.*
Heygate, Col. R. H. G. (D.S.O.) ...	... *Europe.*

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Hichens, G. W. ... ... Rangoon.
Hickman, R. St. J. ... ... Cachar.
Hide, P. (Life Member) ... ... Indore.
Higgins, H. A. ... ... Hatikhira Sylhet.
Higgins, J. C. ... ... Imphal, Manipur.
Higginson, G. R. ... ... Lucknow.
Hignell, S. R. (I.C.S.) ... ... Daltonganj, E.I.Ry.
Hiley, A. C. (I.F.S.) ... ... Belgaum.
Hill, Rev. E. E. (M.A.) ... ... Satara.
Hill, Claude H. (I.C.S., C.I.E.)... ... ... *Europe.*
Hill, E. W. ... ... Mandalay.
Hill, R. D. O. (Life Member) ... ... Dehra Dun.
Hitchcock, R. H. ... ... Malapuram, Malabar District.
Hoare, H. J. (I.C.S.) ... ... *Europe.*
Hobart, R. C. (I.C.S.) ... ... Gorakhpur.
Hodgson, Capt. M. R. K. ... ... Jubbulpore.
Hodgson, Hon'ble Mr. H. P.... ... ... *Europe.*
Hojel, Lt.-Col. J. G. (I.M.S.) ... ... Bombay.
Holberton, N. V. (I.F.S.) ... ... Rangoon.
Hole, R. S. (I.F.S.) ... ... Bombay.
Holkar, H. H. the Maharaja Tukuji Rao (Life Member) ... ... Indore, C. I.
Holland, Dr. H. T. (C.M.S.) ... ... Quetta.
Holland, L. B. ... ... Lahore, Punjab.
Holme, A. T. (I.C.S.) ... ... *Europe.*
Holme, H. B. (I.C.S.) ... ... Simla.
Holmes, H. R. ... ... Kandri Mine, P. O.
Hood, A. F. ... ... Kindat, U. Burma.
Homfray, Jeston ... ... Assam.
Hoosein Belgrami, The Hon'ble Mr. Syed Nawab Imud-ul-Mulk Bahadoor (C.S.I.) ... ... Hyderabad, Deccan.
Hope, A. J. R. ... ... Taunggyi, Burma.
Hopwood, J. C. ... ... Monywa, U. Burma.
Hopwood, S. F. (I.F.S.) ... ... Maymyo, U. Burma.
Hosken, A. Fayrer... ... ... Secunderabad.
Hoste, R. D. ... ... Purulia, Bengal.
Hotson, J. E. B. (I.C.S.) ... ... *Europe.*
Howell, E. B. ... ... *China.*
Howell, G. C. (I.C.S.) ... ... *Europe.*
Howlett, Capt. A. W. (I.M.S.) ... ... Quetta.
Howlett, F. M. (M.A., F.E.S.) ... ... Pusa.
Hudson, Lt.-Col. C. T. (I.M.S.) ... ... Dharwar.
Hudson, Capt. C. ... ... Bangalore.
Hudson, C. W. M. (I.C.S.) ... ... *Europe.*
Hudson, Major J. H. ... ... Meerut.
Hudson, Capt. P. ... ... Rangoon.
Hudson, E. H. (A.M.I.C.E.) ... ... Jalna, Deccan.

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Huggins, J. R. ... ... Madura.
Hughes, Capt. F. L. ... ... Jhelum.
Hughes, T. O. ... ... *Europe.*
Hughes, E. A. ... ... Munmar, S. India
Hulbert, Major J. G. (I.M.S.)... ... ... Muttra.
Hume, H. R. (D.S.P.) ... ... *Europe.*
Humphrys, Capt. F. H. ... ... *Europe.*
Hundley, G. ... ... Rangoon.
Hunt, C. B. Holman... ... ... Federated Malay States.
Hunt, A. R. (I.F.S.)... ... ... Akola, Berar.
Hunt, Capt. A. T. (R.N.) ... . *Europe.*
Hunt, Dr. E. H. ... ... Secunderabad.
Hunt, Capt. F. W. ... ... Somaliland.
Hunter, W. H. ... . Calcutta.
Husbands, H. W. S. (A.M.I.C.E.) ... ... Hingoli, Deccan.
Husbands, Capt. G. S. (I.M.S.) ... ... Hangu, N. W. F. P.
Husbands, J. E. (I.C.S.) ... ... Thana.
Hutchinson, Major F. H. G. (I.M.S.) ... ... Belgaum.
Hutchinson, Major L. T. R. (I.M.S.) ... ... Bombay.
Hyam, Judah (G.B.V.C., F.Z.S.) (Life Member) ... Pusa, Bengal.
Hyde-Cates, Lt.-Col. G. E. ... ... Idar Ahmednagar.
Hyderabad, the Librarian, State Library ... Hyderabad, Deccan.

Ichalkaranji, The Hon'ble Meherban Narayen Govind *alias* Babasaheb Ghorpade, Chief of (Life Member) ... ... Kolhapur.
Idar, Maharaj Kunwar Major Dowlatsing, A.-D.-C. Mahi Kanta.
Inglis, C. C. ... ... Hyderabad.
Inglis, Chas. M. (Life Member) ... ... Durbhanga.
Inglis, H. A. ... ... Anarh Laheria Serai.
Ingram, Capt. A. C. (I.M.S.) ... ... Madras.
Inman, Capt. H. M. (I.M.S.) ... ... Bombay.
Innes, Charles (B.S.C.) ... ... Rangoon.
Innes, Capt. H. (I.M.S.) ... ... Barisal, E. Bengal.
Inverarity, J. D. (B.A., LL.B.) (Life Member) ... Bombay.
Irvine, Major T. W. (I.M.S.) ... ... Peshawar.
Irwin, C. J. (I.C.S.) ... ... Nagpur, C. P.
Ivens, Capt. H. T. C. ... ... Miranshah.
Ivens, J. H. (P.W.D.) (Life Member) ... ... Agra.
Iyer, V. Subramania (M.A.) ... ... Dehra Dun, U. P.

Jackson, Dr. T. S. .. .. Abu Road.
Jackson, Mrs. F. E.... ... ... Assam.
Jackson, H. (I.F.S.) ... ... Naini Tal, U. P.
Jacob, W. R. LeGrand (I.F.S.) ... ... Jalpaiguri.

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James, C. H. ... ... Lahore.
James, Major C. H. (I.M.S.) ... ... Patiala, Punjab.
James, Capt. F. H.... ... ... SantaCruz, Salsette
Jamkhandi, Shrimant Parashram Ramchandra Patwardhan, The Chief of (Life Member)... ... Kolhapur.
Jamsetji M. Doctor ... ... Bombay.
Janjira, H. H. Sir Sidi Ahmed Khan (K.C.I.E.) Nawab of (Life Member) ... ... Janjira.
Janson, V. T. ... ... Bombay.
Jardine, A. J. A. (D.S.P.) ... ... Rangoon.
Jardine, E. R. ... ... Rangoon.
Jardine, M. R. ... ... Bombay.
Jardine, W. E. (I.C.S., C.I.E.) ... ... Neemuch.
Jayakar, Lt.-Col. A. S. G. (I.M.S., Retd.) ... Bandra.
Jayakar, M. S. (M. A.) ... ... Alibag.
Jeddere-Fisher, H. C. ... ... Meerut.
Jellett, H. H. ... ... Calcutta.
Jenkins, Lt. N. M. (R.G.A.) ... ... Aden.
Jenkins, S. E. F. (I.F.S.) ... ... Loilem, Burma.
Jenkins, J. B. ... ... Jalgaon.
Jenkins, H. H. (I.C.S.) ... ... Lahore.
Jennings, Lt.-Col. W. E. (I.M.S.) ... ... *Europe.*
Jermyn, Col. T. ... ... *Europe.*
Jesse, William ... ... Meerut.
Johnson, W. E. C. ... ... Assam.
Johnston, E. G. ... ... Mandalay, Burma.
Johnston, Capt. P. D. C. ... . Lucknow.
Johnstone, J. W. D. (C.I.E.) ... ... Gwalior.
Johnston, Capt. R. G. M. (R.H.A.) ... ... *Europe.*
Johnston-Stewart, H. E. ... ... Lucknow.
Jones, A. E. ... ... Lahore.
Jones, C. P. G. ... ... Burma.
Jones, Lt.-Col. F. W. C. (R.A.M.C.) ... ... *Europe.*
Jones, Lt.-Col. J. Lloyd (I.M.S.) ... ... Calcutta.
Jones, Major M. D. Goring ... ... Nasirabad.
Jones, Capt. T. W. H. ... ... Bombay.
Jones, W. Harvey ... ... Calcutta.
Jones, Dr. W. D. ... ... Kyankse, U.Burma.
Julius, V. A. ... ... Colombo.
Jukes, J. E. C. (I.C.S.) ... ... Calcutta.

Kagal, Meherban Piraji Rao Bapu Saheb Ghote, Chief of ... ... Kagal, S. M. C.
Karachi Victoria Museum ... ... Karachi, Sind.
Kauffman, Oscar ... ... Marburg *A/L.* Germany.
Keddie, D. L. ... ... Burma.
Keddie, J. F. ... ... Raheng, Siam.

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Kelly, B. P. ... ... *Europe.*
Kelly, Capt. C. R. (R.G.A.) ... ... Srinagar.
Kelly, Major H. N. ... ... Jubbulpore, C. P
Kelsall, Major H. J. (R.A.) ... ... *Europe.*
Kemball, Major A. G. ... ... Nowshera.
Kemball, H. L. ... ... Gurgaon, Punjab.
Kemball, H. V. (C.E.) ... ... Poona.
Kennedy, Capt. R. S. (I.M.S.)... ... ... *Europe.*
Kennedy, R. ... ... Bombay.
Kennion, Major R. C. (F.Z.S.) ... ... *Europe.*
Kenrick, Major W. H. (I.M.S.) ... ... Khandwa.
Keogh, A. D. ... ... Narayanganj, E. B and Assam.
Kerthoven, E. J. (Hon. Correspg. Member) ... Java.
Kerr, Dr. A. F. G.... ... ... Chiengmai, Siam.
Kerr, H. R. ... ... Pyinmana, Burma.
Kerr, Nigel ... ... Bombay.
Kettlewell, Capt. H. W. ... ... *Europe.*
Keys, Capt. W. D. A. (I.M.S.) ... ... Rajkote.
Khan, Muncherji Framji (Life Member) ... Bombay.
Khareghat, M. P. (I.C.S.) ... ... Bombay.
Kiddle, J. A. C. ... ... Moulmein.
Kilkelly, Major P. P. (I.M.S.) ... ... *Europe.*
Kilner, Dr. J. N. (M.B.) ... ... Chinpina, Adra, Bengal.
Kilmartin, A. J. ... ... Jaffna, Ceylon.
King Edward Library, The Hon. Secretary ... Rawalpindi.
King, A. W. ... ... Dacca.
King, Capt. Geo. (I.M.S.) ... ... Calcutta.
King, R. C. H. Moss (I.C.S.) ... ... Nagpur, C. P.
Kingston, A. H. ... ... Bombay.
Kinloch, A. M. ... ... Nelliampatty.
Kinloch, Victor ... ... Klang, Federated Malay States.
Kirkness, L. H. ... ... Madras.
Kirtikar, Lt.-Col. K. R. (I.M.S., Retd.)... ... Andheri, Salsette.
Knyvett, Capt. W. A. ... ... Bankipur.
Koechlin, M. C. ... ... Travancore.
Kolhapur, H. H. the Maharaja Sir Shahu Chhatrapati (G.C.S.I., G.C.V.O.) (Life Member) ... ... Kolhapur.
Kotah, H. H. the Maharaja Sir Umed Sing, Bahadoor (K.C.S.I.) (Life Member) ... ... Kotah.
Kushal Pal Singh, Raja ... ... Kotla, Agra Dist.
Kynaston, E. ... ... Yatiyantola, Ceylon.

Lace, E. W. .. .. Waltair.
Lace, John H. (I.F.S., F.L.S.) ... ... Maymyo.

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Lahore, Curator, Central Museum ... ... Lahore.
Lahore Punjab Veterinary College, The Principal.. Lahore.
Laird-MacGregor, E. G. L. (I.C.S.) ... ... Dharwar.
LaTouche, J. N. D. ... ... Bombay.
Lamb, The Hon'ble Mr. R. A. (I.C.S., C.I.E.) (Life Member)... ... ... Poona.
Lambton, Capt. G. C. ... ... Ootacamund.
Lane, H. S. ... ... Bangalore.
Lane, Capt. W. H. ... ... Baroda Camp.
Lantour, E. de ... ... Sitapur, U. P.
Laurence, Revd. Mr. F. (C.M.S.) ... ... Amritsar, Punjab.
Laurie, A. S. (P.W.D.) ... ... The Nagavalli Project, Vizagapatam Dist.
Lawrence, T. R. ... ... Bombay.
Leach, F. B. ... ... Rangoon.
Lee, A. J. (I.M.S.) ... ... Delhi.
Lee, Major A. W. H. ... ... Quetta.
Lee, Lt.-Col. F. ... ... *Europe.*
LeMesurier, H. P. (C.E.) ... ... Calcutta.
Lemarchand, J. R. ... ... Kookila Mook, Assam.
Lee-Wilson, Rev. H. W. .. .. Poona.
Lee, D. H. (Life Member) ... ... *Europe.*
Lees, John ... ... Itakhola Sylhet.
Leeson, G. W. ... ... Barisal, Bengal.
Leete, F. A. (F.C.H., I.F.S.) ... ... Tharrawaddy.
Lefroy, H. Maxwell (M.A., F.E.S., F.Z.S.) ... *Europe.*
Leftwich, C. G. (I.C.S.) ... ... Khandwa.
Legard, Chas. ... ... Mercara.
Leonard, Capt. W. H. ... ... Bombay.
Leslie, Major G. A. J. (R.E.) ... ... *Europe.*
Leslie, M. ... ... *Europe.*
Ley, A. H. (I.C.S.) ... ... Calcutta.
Light, Capt. W. A. ... ... Bombay.
Lightfoot, S. St. C. ... ... Taunggyi, Burma.
Lilburn, W. ... ... *Europe.*
Limaye, S. P. ... ... Dhulia.
Lindley, E. S. (C.E.) ... ... Bombay.
Lindsay-Smith, Capt. J. (I. A.) ... ... Punjab.
Linnell, Fred. ... ... Rangoon.
List, John N. ... ... Henzada, Burma.
Lister, R. S. ... ... Ghoom, D.-H. Ry.
Liston, Major W. G. (I.M.S.) ... ... Bombay.
Little, E. ... ... Kirkee.
Little, F. D. ... ... *Europe.*
Lloyd, Capt. C. R. (A.S.C.) ... ... Bombay.
Lloyd, Capt. R. E. (I.M.S.) ... ... Calcutta.

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Lloyd, Capt. R. A. (I.M.S.)	... Bannu, N.W.F.P.
Loam, Mathew	... Madanapalli, Madras Presidency.
Lock, Major F. R. E. (I.S.C.) ...	... Aurungabad.
Lodge, G. E.	... *Europe.*
Logan, R. O.	... Wellington, India.
Logan Home, W. M.	... Kohat.
Lomas, H. A. (I.C.S.)	... Mussoorie.
Long, G. R. (I.F.S.) (Life Member) ...	... Rangoon.
Long, Capt. W. C.	... Coimbatore.
Longden, C. C.	... Colombo.
Lory, F. B. P. (M.A.)	... *Europe.*
Lovegrove, W. H. (I.F.S.)	... Jummoo.
Lovell, E. H. (R.A.)	... Ambala.
Lowis, Major R. M.	... Dera Ghazi Khan.
Lowndes, G. R.	... *Europe.*
Lowrie, A. E. (I.F.S.)	... Raipur.
Lowsley, C. O.	... *Europe.*
Lowther, Major H....	... Bolarum, Deccan.
Luard, Major C. E....	... Indore.
Lucas, P. N. A.	... *Europe.*
Lucas, The Hon'ble Mr. W. H. (I.C.S.)...	... *Europe.*
Luck, W. H.	... Nasik.
Lucknow, The Curator, Provincial Museum	... Lucknow.
Ludlow, F.	... Karachi.
Luffman, M. A.	... Camilla, Tippera.
Luke, J. H.	... Narayenganj.
Luke, K. J.	... Chatalpara, Bengal.
Lumley, C. C.	... Dacca.
Lumsden, O. F. (I.C.S.)	... Amritsar.
Lund, E.	... Balur P.O.
Lunham, Capt. J. L.	... Poona.
Lushington, P. M. (I.F.S.)	... Coimbatore.
Lyall, Capt. R. A.	... *Europe.*
Lyall, J. H. (I.F.S.)	... Haldwani.
Lynn, G. R. (C.E.)	... Manora, Karachi.
MacDonald, Dr. D. (Life Member) ...	... *Europe.*
Macdonald, K. C. (D.S.P.)	... Amherst, Burma.
MacGregor, J. A....	... Arconam, Madras.
MacGregor, Capt. R. D. (I.M.S.) ...	... Rangoon.
Macintyre, D.	... Dehra Dun.
Mackay, C. J.	... Mymensingh.
Mackenna, J. (I.C.S.)	... Mandalay.
Mackenzie, Colin A.	... Ootacamund.
Mackenzie, Capt. K. L. W.	... *Europe.*
Mackenzie, Lt. L. H. L. (I.M.S.) ..	... Bombay.
Mackenzie, M. M.	... Saran, Bengal.

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Mackie, A. W. W. (I.C.S.) ... ... *Europe.*
Mackinlay Chas. ... ... *Europe.*
Mackinnon, P. W. (F.E.S.) ... ... Mussoorie.
Mackwood, F. M. ... ... Colombo.
MacLachlan, R. B. ... ... Sukkur, Sind.
Macleod, N. A. ... ... Calcutta.
Macleod, The Hon'ble Mr. Justice N. C. ... *Europe.*
MacMichael, N. (I.C.S.) ... . Chatrapur, Ganjam.
MacNair, R. H. (I.C.S.) ... ... Calcutta.
Macnab, A. M. ... ... Maymyo.
Macnaghten, H. P. W. (B.A.)... ... ... Calcutta.
Macperson, R. E. ... ... Sholapur.
Macpherson, Col. T. R. M. ... ... *Europe.*
Macrae, Major J. L. (I.M.S.) ... ... *Europe.*
Macwatt, Lieut.-Col. R. C. (I.M.S.) ... ... *Europe.*
Madras, The Professor of Zoology, Christian College ... ... Madras.
Madras, The Principal, Presidency College ... Madras.
Madras, The Principal Agricultural College and Research Institute ... ... Coimbatore.
Madras, The Librarian, Govt. Central Museum ... Madras.
Magrath, Major H. A. F. ... ... Peshawar.
Mahaluxmiwalla, C. D. ... ... Bombay.
Mahomedbhoy Currimbhoy Ebrahim ... ... Bombay.
Main, T. F. ... ... Poona.
Major, Major Forbes ... ... Baroda.
Maltby, C. M. ... ... Upper Topa, Murree.
Manavadar, Khan Shree Fatehdinkhan, Chief of (Life Member) ... ... Kathiawar.
Manders, Lt.-Col. N. (R.A.M.C., F.Z.S., F.E.S.) (Life Member) ... ... Colombo.
Mandlik, Narayan V. (Life Member) ... ... Bombay.
Mann, H. H. ... ... Poona.
Mann, T. H. ... ... *Europe.*
Manners-Smith, Lt.-Col. J. (V.C., C.I.E.)... ... Nepal.
Manson, C. E. F. ... ... Mandalay.
Marjoribanks, N. E. (I.C.S.) ... ... Madras.
Marryatt, N. ... ... Abu Road.
Marsden, E. ... ... *Europe.*
Marshall, Arch. McL. (Life Member) ... ... *Europe.*
Marshall, A. W. ... ... Bombay.
Marshall, D. ... ... *Europe.*
Marshall, Dr. H. H. (L.R.C.S.)... ... ... Rangoon.
Marshall, J. McL. (Life Member) ... ... *Europe.*
Marshall, Major T. E. (R.A.) ... ... Quetta.
Marten, James ... ... Mussoorie.
Martin, A. Ff. ... ... Ramnad Dist., S. I.

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Martin, Col. Gerald (Life Member) ... ... *Europe.*
Martin, Capt. J. ... ... *Europe.*
Martin, L. K. ... ... Chanda.
Martindell, H. E. W. ... ... Shwebo, Burma.
Masani, A. M. (Life Member) ... ... Baroda.
Mason, C. W. ... ... *Europe.*
Masson, The Hon'ble Sir D. P. (K.C.I.E.) ... Lahore.
Maung, Po Bye (K.S.M. & F.R.C.I.) ... ... Myaung-Mya, Burma.
Maunsell, Capt. E. C. C. ... ... Baroda.
Maxwell, R. M. (I.C.S.) ... ... Karwar, Kanara.
Maxwell, Capt. W. F. (R.E.) ... ... Fatehgarh, U. P.
Mayes, W. ... ... Lahore.
Mayne, Capt. H. B. (R.G.A.) ... ... Bombay.
McCarrison, D. L. (D.S.P.) ... ... Rajamundri.
McComas, H. ... ... Lucknow.
McCrie, C. M. (I.F.S.) ... ... Dehra Dun.
McCudden, Capt. J. H. ... ... Poona.
McDiarmid, K. ... ... *Europe.*
McDonald, J. ... ... *Europe*
McDonough, A. D. ... ... Campbellpore.
McGeorge, J. C. ... ... *Europe.*
McGlashan, John (C.E.) ... ... Calcutta.
McIlwrick, L. ... ... Bombay.
McIntosh, Alex. (C.E.) ... ... Trichinopoly.
McIntosh, R. (I.F.S.) ... ... Tharrawaddy.
McKerron, R. G. (M.A., I.C.S.) ... ... Rangoon.
McKendrick, Capt. A. G. (I.M.S.) ... ... Coonoor.
McKenel, A. ... ... *Europe.*
McLeod, W. C. ... ... Mergui, Burma.
McMahon, Col. The Hon. Sir A. H. (K.C.I.E., C.S.I.). Calcutta.
McMullen, Capt. G. C. ... ... Amritsar.
McNeale, J. H. ... ... *Europe.*
McNeill, J. (I.C.S.) ... ... Poona.
McPherson, Major G. (I.M.S.)... ... ... Bombay.
McPherson, Capt. J. (I.M.S.) ... ... Bombay.
Mead, P. J. (I.C.S.) ... ... Bombay.
Mears, Major A. (I.A.) ... ... Bombay.
Meikle, H. G. W. ... ... Bombay.
Meinertzhagen, Capt. R. ... ... Mauritius.
Menon, K. G. ... ... Cochin.
Mercer, A. W. ... ... Rawal Pindi.
Merewether, Lt.-Col. H. D. ... ... *Europe.*
Mess President, R. A. Mess ... ... Colaba.
Mess President, R. A. Mess ... ... Roorkee.
Mess President, Leicestershire Regt. ... ... Madras.
Mess President, 1st South Wales Borderers ... *Europe.*
Mess President, 1st Connaught Rangers ... Dagshai.

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Mess President, 2nd Worcestershire Regt.	... Jhansi.
Mess President, 6th Jat. Light Infantry	... Secunderabad.
Mess Secretary, 18th Infantry ...	... Ferozepore.
Mess Secretary, 1/39th Garhwal Regiment	... Lansdowne, U. P.
Mess President, 41st Dogras	... Cawnpore.
Mess President, 44th Merwara Infantry	... Ajmer.
Mess President, 45th Rattray's Sikhs ...	... Nasirabad.
Mess President, 52nd Sikhs, F. F. ...	... Peshawar.
Mess Secretary, 58th Rifles F. F. ...	... Quetta.
Mess Secretary, 59th Scinde Rifles ...	... Kohat.
Mess President, 64th Pioneers ...	... Belgaum.
Mess Secretary, 74th Punjabis, Book Club	... Lucknow.
Mess President, 85th Regiment (K.S.L.I.)	... Secunderabad.
Mess Secretary, 87th Punjabis ...	... Jhelum.
Mess Secretary, 91st Punjabis ...	... Meiktila, Burma.
Mess President, 101st Grenadiers ...	... Mhow.
Mess President, 103rd Mahratta Lt. Infy.	... Ahmednagar.
Mess Secretary, 109th Infantry ...	... Secunderabad.
Mess President, 110th Mahratta L. Infantry	... Belgaum.
Mess President, 117th Marathas ...	... Jask.
Mess President, 122nd Infantry ...	... Fort Sandeman.
Mess Secretary, 39th C. I. Horse ...	.. Goona.
Mess President, 1/10th Gurkhas ...	... Maymyo.
Mess Secretary, R. I. M. S. "Dufferin"	... Bombay.
Messent, P. G. (C.E.)	... Bombay.
Metcalfe, J. G. E.	... Bombay.
Meyer, O.	... Bombay.
Meyrick, E. (F.R.S.)...	... *Europe.*
Middleton, L. W.	... Sonapore. Assam.
Millard, W. S. (F.Z.S.) (Life Member) ...	... *Europe.*
Miller, W. A. H.	... Karwar.
Millett, Hon'ble Mr. G. P. (I.F.S.) ...	... Poona.
Mills, J. D. (Life Member)	... *Europe.*
Milne, Mrs. Leslie	... *Europe.*
Milner, C. E.	... Tharrawaddy,
Milward, R. C. (I.F.S.)	... Dehra Dun.
Minns, Mrs. H. C.	... Rangoon.
Miraj, Shrimant Gungadhar Rao Ganesh, *alias* Baba-saheb Patwardhan, Chief of (Life Member)	... Miraj.
Mitchell, F. J.	... Srinagar.
Mitchell, R. St. J.	... Nanded Dn.
Mitchell, H. H. G.	... Madras.
Mitchell, J. C. H.	... Tezpur, Assam.
Mockler, Major G. F.	... Kashmir.
Modi, Bomanji Edulji	... Kaira.
Moggridge, C. B.	... Mandalay.
Mohun Shumshere Jung Bahadur, General	... Nepal.
Mollison, J.	... *Europe.*

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Montagnon, D. J. ... ... Sylhet.
Monté, Dr. D. A. de (L.M. & S.) ... ... Bandora.
Monteath, G. (I.C.S.) (Life Member) ... ... *Europe.*
Monteath, J. (I.C.S.) ... ... Radhanpur.
Montmorency, G. F. de (I. C. S.) ... ... Lyallpur.
Montgomerie, A. (I.C.S.) ... ... Dhulia.
Montgomerie, C. W. E. (I. C. S.) ... ... Jubbulpore.
Montresor, Capt. L. B. (R.F.A.) ... ... Belgaum.
Moore, T. D. ... ... Bombay.
Moore, J. ... ... *Europe.*
Moore, W. (F.I.C.) ... ... Bombay.
Moore, W. G. ... ... Mandalay.
Morgan, Mrs. Chas. ... ... Mangalore.
Morris, Major A. H. (R.A.M.C.) ... ... *Europe.*
Morris, A. P. (B.SC.) ... ... Myittha, U. Burma.
Morris, Major D. O. ... ... Akola, Berar.
Morris, Major G. M. ... ... Rawalpindi.
Mosse, Capt. A. H. E. (Life Member) ... ... Dwarka.
Mosley, N. ... ... Bombay.
Motilal Vallabhji ... ... Bombay.
Moule, Capt. H. E. ... ... Myitkyina, Burma.
Mowbray, G. B. De... ... ... Maskeliya, Ceylon.
Moylan, W. M. ... ... Betul, C. P.
Moysey, E. L. (I.C.S.) ... ... Thana.
Muir, G. B. F. (I.C.S.) ... ... Agra.
Mudhol, Shrimant Malojirao Raje Ghorpade, Chief of ... ... Mudhol, S. M. C.
Mullan, J. P. (M.A.) ... ... Bombay.
Muller, C. H. A. ... ... Lahore.
Müller, Professor O. V. ... ... Bombay.
Mullings, C. T. ... ... Guntur.
Mullins, Bt.-Col. W. B. ... ... Chaman.
Mulraj, Lala ... ... Quetta.
Mumford, J. ... ... *Europe.*
Mundy, B. H. H. (F.R.G.S.) ... ... Bombay.
Mundy, N. S. ... ... Silchar, Cachar.
Munna Lâl, Dr. (L.M. & S.) ... ... Bara Banki.
Munn, Leonard ... ... Secunderabad.
Murison, Capt. C. C. (I.M.S.) ... ... Bombay.
Murphy, Capt. A. (I.M.S.) ... ... *Europe.*
Murphy, E. J. ... ... Rangoon.
Murray, A. G. ... ... Nelliampatty.
Murray, Lt. J. Wolfe (R. N.) ... ... Persian Gulf.
Murray, Capt. J. H. (I.M.S.) ... ... *Europe.*
Murray, R. A. C. ... ... Peshawar.
Murray, R. D. ... ... Kasauli.
Murray, S. B. (P.W.D.) ... ... Madras.
Muspratt, Lt.-Col. F. C. ... ... Bombay.

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Mysore, Agricultural Chemist ... ... Bangalore.
Mysore, The Superintendent, Mysore Government Museum ... . Bangalore.
Mysore, H. H. the Maharaja Krishna Raj Woodayar Bahadoor (G.C.S.I.) (Life Member) ... ... Mysore.

Nahar Singh of Bedla, Rao ... ... Bedla near Udaipur.
Nangle, Capt. M. C. ... ... Rangoon.
Napier, A. G. Fitz.... ... ... Allahabad.
Napier, A. H. (I.M.S.) ... ... Dera Ismail Khan.
Naranji Dwarkadas (Life Member) ... ... Bombay.
Narrotumdas Morarji Goculdass (Life Member) ... Bombay.
Nasrulla Khan, H. H. Nawab Mahomed ... Bhopal, C. I.
Needham, J. E. ... ... Bombay.
Nene, Sadashive Sitaram ... ... Sangamner, Ahmednagar Dist.
Nevill, T. N. C. ... ... *Europe.*
Newcome, Lionel ... ... Shanivarsante P.O., N. Coorg, S. India.
Newnham, Lieut.-Col. A. (F.Z.S.) ... ... Jullundur.
Nicholetts, W. A. ... ... *Europe.*
Nicholson, E. M. F. ... ... Bombay.
Nicholson, E. F. (F.Z.S.) ... ... Bombay.
Nicholson, Capt. E. H. ... ... Mauritius.
Nicholson, Major W. C. ... ... Ferozepore.
Nicoll, Mrs. C. V. ... ... Kajang, Selangor.
Nisbett, Major W. G. ... ... Mandalay.
Nizam's College, The Librarian ... ... Hyderabad, Deccan.
Noyce, F. (I.C.S.) ... ... *Europe.*
Nurse, Lt.-Col. C. G. (F.E.S.) (Life Member) ... *Europe.*
Nuttall, W. M. ... ... Dibrugarh.

Oates, E. W. (F.Z.S.) (Hon. Correspg. Member) ... *Europe.*
Oberholser, H. C. ... ... Washington, U.S.A.
O'Brien, Capt. H. C. H. ... ... Nowshera.
O'Brien, P. ... ... Thana.
O'Brien, Major Edward ... ... *Europe.*
O'Callaghan, F. M. ... ... Gauhati, Assam.
O'Donel, H. V. ... ... Alipur, Duars.
O'Donnell, O. ... ... *Europe.*
O'Donnell, Lt.-Col. T. J. (D.S.O., R.A.M.C.) ... Quetta.
O'Nash, E. ... ... Calcutta.
Ogilvie, A. W. (I.F.S.) ... ... Raheng *via* Moulmein and Kawkerick.
Ogilvy, W. ... ... U. Burma.
Okeden, W. P. ... ... Rangoon.
Oliphant, J. ... ... *Europe.*

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Oliphant, J. N.	...Kheri, Oudh.
Oliver, Lt.-Col. L. G.	...Allahabad.
Olivier, Col. H. D. (R.E., F.Z.S.) (Life Member)	...*Europe.*
Ollenbach, O. C.	...Dehra Dun, U. P.
Orchha, H. H. the Raja Bhagvunt Singji	...Tikumgarh, Bundelkhund.
Ormiston, W.	...Ceylon.
Orr, Capt. H. M. C.	...*Europe.*
Orr, J. P. (I.C.S.)	...Bombay.
Osborn, Genl. W.	...Kangra District.
Osmaston, A. E. (I.F.S.)	...Gorakpur.
Osmaston, B. B. (I.F.S.)	...Dehra Dun.
Osmaston, L. S. (I.F.S.)	...*Europe.*
O'Sullivan, Col. D. (R.A.M.C.) ...	...*Europe.*
Owen, W. Tudor (I.C.S.)	...Palitana, Kathiawar.
Oxley, Capt. J. C. S. (I.M.S.)	...*Europe.*
Paddison, G. F. (I.C.S.)	...Madras.
Page, W. G.	...*Europe.*
Page, W. T. (F.Z.S.)	...*Europe.*
Page, W. W. K.	...Calcutta.
Paget, B. C. T.	...Wellington, Nilgiris
Paget, Dr. A. J. M. (M.D., etc.) ...	...Berbera, Somaliland
Painter, H. L. (I.C.S.)	...Bombay.
Palanpur, Shah Zada Taley Mahomed Khan	...Palanpur.
Palmer, Capt. C. E. (I.M.S.)	...Bombay.
Palmer, W. L. (I.F.S.)	...*Europe.*
Panday, Mrs. J. L.	...Bombay.
Pandit, S. Prem N...	...Jaipur, Rajputana.
Panna, H. H. the Maharaja Mohendra Yadvendra Singh Bahadur	...Ajmer.
Parames, N. V. (C.S.)	...Ernakulam, Cochin.
Pargeter, C. E.	...*Europe.*
Parish, N. B.	...Alwar, Rajputana.
Parker, R. N. (I.F.S.)	...Abbottabad.
Parnell, R. (I.F.S.)	...Kangra District.
Parrington, Capt. J. W. (R.A.) ...	...Bangalore.
Parsons, A. A. L. (C.S.)	...Patiala.
Parsons, A. E. B.	...Peshawar.
Parsons, S. R.	...Mandla, C. P.
Parshotumdas Vishram Maoji ...	...Bombay.
Partridge, E. A.	...Secunderabad.
Parton, F. J.	...Koppa P. O., Kadur District.
Pascoe, J. Harding...	...Kulla Kamby, Nilgiris.
Pasteur Institute of India, The Director	...Kasauli, Punjab.

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Patel, Khan Bahadoor Burjorji D. ... ... Quetta.
Patiala, H. H. the Maharaja of ... ... Patiala.
Patton, Capt. W. S. (I.M.S.) ... ... Guindy, Saidapet.
Patuck, P. S. (I.C.S.) ... ... Wardha.
Powalla, Jamsetji C. ... ... Bombay.
Payne, R. (B.A.) ... ... Bankipur, E. I. Ry
Pearce, Major C. R. (I.M.S.) ... ... Maymyo.
Pears, S. G. (I.C.S.)... ... ... Parachinar.
Pearse, Lt.-Col. J. L. ... ... *Europe.*
Pearson, R. S. (I.F.S.) ... ... Dehra Dun, U. P.
Pechey, W. P. ... ... Bombay.
Peck, N. F. (I.C.S.) ... ... Chittagong.
Peile, Capt. H. D. (I.M.S.) ... ... *Europe.*
Pendlebury, W. M. F. ... ... Jalna, Deccan.
Penton, Lt.-Col. R. H. (R.A.M.C.) ... ... Poona.
Percival, A. P. (I.F.S.) ... ... *Europe.*
Percival, G. S. P. ... ... Mercara, Coorg.
Percy-Rae, A. E. ... ... Rangoon.
Perfect, S. R. (P.W.D.) ... ... Karachi.
Perreau, Capt. G. A. ... ... Bakloh, Punjab.
Pershouse, Lt. S. ... ... Rangoon.
Pestonji Jivanji (N.C.S.) (Life Member) ... ... Hyderabad, D.
Peters, Col. C. T. (I.M.S. retd.) ... ... Dinajpur.
Petit, Bomanji Dinshaw (Life Member) ... ... Bombay.
Petit, Dhunjibhoy Bomanji (Life Member) ... Bombay.
Petit, Jehangir Bomanji (Life Member)... ... Bombay.
Petley, C. A. ... ... Toungoo.
Phillimore, Capt. R. H. (R.E.) ... ... Maymyo.
Phipson, H. M. (F.Z.S.) (Life Member) ... *Europe.*
Phythian, Adams, Lt. E. G. P. ... ... *Europe.*
Pickersgill-Cunliffe, Lt. J. C. ... ... Jhansi.
Pickthall, Capt. J. W. ... ... Rangoon.
Pilcher, Col. J. G. (I.M.S.) ... ... *Europe.*
Pile, J. ... . Secunderabad.

Pinfold, E. S. ... ... Rangoon.
Pinhey, Lt.-Col. A. F. (C.I.E.) ... ... Hyderabad, Deccan.
Pipe, T. S. ... ... Nasik.
Pitt, W. H. ... ... Rajamundri.
Plunkett, P. E. ... ... Katha, U. Burma.
Pollard, Capt. A. E. St. V. ... ... Port Blair, Andamans.
Pollard, G. F. (F.Z.S.) ... ... Dehri, Garhwal.
Polovtsoff, Mons. A. ... ... *Europe.*
Poncins, Baron Edmond de (Life Member) ... *France.*
Pope, J. A. (I.C.S.) ... ... Satara.
Porter, A. A. ... ... Lakon, U. Siam.
Pottinger, Lieut. J. A. ... ... Jhansi.

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Pottinger, Major R. S.	... Bombay.
Powalla, Jemsetji C.	... Bombay.
Powell, Dr. A.	... Bombay.
Powell, J. E.	... Mussurrie.
Powell, W.	... *Europe.*
Powell, W. S. (I.F.S.)	... Rangoon.
Praed, Lt. G. A. M.	... Nowgong.
Prall, Lt.-Col. S. E. (I.M.S.)	... Aden.
Pratt, H. C.	... Selangor.
Preston, F. J.	... Bombay.
Priestley, E.	... Mirpurkhas.
Primrose, Alex. M.	... Punkabari, Duars.
Procter, The Hon'ble Sir H. E. ...	... *Europe.*
Proctor, Capt. Alfred H. (I.M.S.) ...	... Hongkong.
Professor of Forestry, Oxford University	... *England.*
Punjab Agricultural College, The Principal	... Lyallpur.
Punjab Government Horticultural Gardens, Supdt.	Lahore.
Purkis, F. C. (B.F.S.)	... Rangoon.
Purkis, H. V.	... Madhopur, District Gurdaspur.
Quin, Capt. R. P.	... Cawnpore.
Quinlan, D. (M.R.C.V.S.)	... Calcutta.
Quinn, Dr. T. W.	... Betul, C. P.
Rae, Capt. M. E.	... *Europe.*
Raikes, E. B.	... *Europe.*
Rajkumar College, the Principal ...	... Rajkote.
Ralston, Lt. W. H.	... Kashmir.
Raper, J. C. D. (A.M.I.C.E.)	... Lanowli.
Ravenshaw, Col. C. W. (Life Member) ...	... *Europe.*
Readymoney, N. J.	... Bombay.
Rebello, Rev. João	... Margoa, Goa.
Rector, St. Mary's College	... Mazgaon, Bombay.
Redmond, Rev. J.	... Chickmagalore, Mysore.
Rees, R.	... Chandkhira Sylhet.
Rees, W. E.	... Gaya, Bengal.
Reichwald, Capt. W. F. (R.H.A.) ...	... Mhow.
Reid, Cecil H. (I.C.S.)	... Calcutta.
Reid, M. F. (C.I.E.)...	... *Europe.*
Reid, R. N. H.	... Mercara, Coorg.
Reid, W. J. (I.C.S.)	... Dacca.
Reiley, R. C.	... Kandri P. O.
Reilly, N. E.	... Panjgur, Mekran Coast.
Reinhart, W.	... Bombay.
Reinhold, Capt. C. H. (I.M.S.) ...	... *Europe.*
Remington, G. L.	... Abu Road.

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Rendall, H. D. (I.C.S.) ... ... Junagad.
Rennick, Lt.-Col. Alex. de C. ... ... Delhi.
Rennie, Thos. (I.C.V.D.) ... ... Rangoon.
Reynolds, Capt. D. (R.F.A.) ... ... Nowshera.
Reynolds, G. N. ... ... Saugar, C. P.
Reynolds, L. W. (I.C.S.) ... ... Calcutta.
Rhé-Philipe, G. W. V. de ... ... *Europe.*
Rhenius, C. E. ... ... *Europe.*
Rhodes, T. M. ... ... *Europe.*
Rice, H. D. ... ... *Europe.*
Richards, B. D. (B. SC.) ... ... Lanowli.
Richmond, R. D. (I.F.S.) ... ... Coimbatore.
Ritchie, Major C. McI. (R.H.A.) ... ... Lahore Cant.
Robert, A. W. ... ... Kistna District.
Roberts, A. A. Lane (I.C.S.) ... ... Kulu, Punjab.
Roberts, Capt. A. S. B. ... ... Rangoon.
Roberts, Lt.-Col. J. R. (I.M.S.) ... ... Indore, C. I.
Roberts, Major M. B. (Life Member) ... ... Garhwal, U. P.
Robertson, Hon'ble B. (I.C.S., C.I.E.) ... ... Calcutta.
Robertson, T. B. ... ... *Europe.*
Robertson, J. H. (I.C.S.) ... ... *Europe.*
Robertson, Laurence (I.C.S.) ... ... Bombay.
Robertson, L. V. M. (I.C.S.) ... ... Hyderabad-Sind.
Robinson, Lt. H. G. ... ... Peshawar.
Robinson, H. K. (I.F.S.) ... ... Kurseong.
Robinson, Hon'ble Mr. Justice S. M. ... ... Rangoon.
Robinson, Major H. ... ... Poona.
Roddis, F. ... ... Dacca.
Rodger, A. (I.F.S.) ... ... Dehra Dun.
Rogers, A C. ... ... *Europe.*
Rogers, A. K.... ... ... Barrakpore, Bengal.
Rogers, C. G. (I.F.S.) ... ... Bombay.
Rogers, J. B. Leslie ... ... *Europe.*
Rogers, Rev. K. St. A. ... ... Raraai, East Africa.
Rogers, W. S. ... ... Bombay.
Rome, H. C. ... ... Peshawar.
Rooke, E. A. ... ... Balaghat, C. P.
Roper, F. ... ... *Europe.*
Rorie, J. J. ... ... Toungoo, Burma.
Rose, Col. H. ... ... Lucknow.
Rosenthal, F. M. ... ... Secunderabad.
Ross, J. P. ... ... Bombay.
Ross, Major Tyrell (Life Member) ... ... Dilkhusha, U. P.
Routh, Capt. G. F. S. ... ... Kohat.
Roughton, N. J. ... ... Khandwa.
Row, Dr. R. (M.D.) ... ... Bombay.
Rowan, Revd. T. (B. D.) ... ... Panchgani.
Rowlandson, E. J. ... ... Vellore, N. Arcot.

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Rudman, F. R. R. (I.C.S). ... ... Jubbulpore.
Rushton, C. E. ... ... Mandalay.
Russell, A. J. .. .. Banmank, U. Burma.
Russell, Hon'ble Mr. Justice L. P. ... ... Bombay.
Rust, P. J. (I.C.S.) ... ... Rupar, Umballa.
Rutherford, W. F. ... ... China.
Ryan, G. M. (I.F.S.)... ... . Karachi.
Ryan, J. G. ... ... Cawnpore.
Ryan, W. J. N. ... . *Europe.*
Rylands, H. R. ... ... *Europe.*
Ryves, A. E. ... ... Allahabad.

Sale, Edward L. (I.C.S.) ... ... Bombay.
Salkeld, Capt. R. E.... ... ... *Kismayu, British East Africa.*
Salmon, Capt. W. H. B. ... ... Poona.
Salt, Capt. H. F. (R.F.A.) ... ... Rawalpindi.
Samers, W. B. (M.B.) ... ... Rangoon.
Sampson, E. D. ... ... Hubli.
Sanderson, P. M. D. ... ... Bombay.
Sangli, Shrimant Chintamanrao Appasaheb Patwardhan ... ... Sangli, S. M. C.
Saone, G. Prier De ... ... *Europe.*
Sassoon, Mrs. S. D. ... . Bombay.
Saxby, H. B. ... ... Ajmer.
Saunders, Capt. C. ... ... *Europe.*
Saunders, H. F. ... ... Gwalior, C. I.
Saunders, Major F. W. (R.E.) ... ... Bombay.
Savile, L. H. ... ... Bombay.
Scindia, H. H. the Maharaja Sir Madhowrao (G.C.S.I., G.C.V.O.) (Life Member) ... ... Gwalior, C. I.
Schomberg, R. C. F. ... . Taiping.
Schultz, Chas. S. ... ... *Europe.*
Scot, J. S. (I.F.S.) ... ... Guntur.
Scott, Edmund ... ... Ceylon.
Scott, Capt. G. B. ... ... Alipur.
Scott, G. B. ... ... Ahwaz.
Scott, F. B. ... ... Dehra Dun.
Scott, R. P. ... ... Bombay.
Scrafton, J. E. B. ... ... Secunderabad.
Scroggie, Capt. W. R. J. (I.M.S.) ... ... Mercara, Coorg.
Scroope, H. W. P. (I.C.S.) ... ... *Europe.*
Selby. Major W. (D.S.O., F.R.C.S., I.M.S.) ... Lucknow.
Seale, Dr. C. E. B.... ... . Darjeeling.
Sealy, Major A. E. ... ... Gurdhaspur, Punjab

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Seervai, Dr. Rustom F.	... Bombay.
Sirdar, Anandrao Scindia	.. Gwalior, C. I.
Seton-Karr, H. W. (Life Member) ...	... *Europe.*
Settlement Reading Club, The Principal	... Port Blair.
Sewell, J. H.	... Rangoon, Burma.
Seymour Sewell, R. B. (I. M. S.) ...	... Calcutta.
Shakespear, Lt.-Col. J.	... Imphal, Manipur.
Shand, J. H. B. (I.M.S.)	... Baroda Camp.
Sharp, The Hon'ble Mr. W. H. ...	... Poona.
Sharp, H.	... Shillong.
Shaw, H. J.	... Bombay.
Shaw, Capt. W. S. J. (I.M.S.) ...	... Rangoon.
Sheldon, Dr. J. H.	... Toungoo, Burma.
Shebbeare, E. O.	... Jalpaiguri.
Shepherd, Philip	... Quetta.
Shepherd, W. C. (I.C.S.)	... Bijapur.
Shepperson, C. J. W.	... *Europe.*
Shipp, W. E.	... Ajmer.
Shevade, S. V. (B. SC.)	... Kirkee.
Shore, H. A.	... Waltair.
Shortland, C. V. N. (A.M.I.C.E.) ...	... Bilaspur, C. P.
Short, Lt.-Col. A. (R.H.A.)	... Mhow, C. I.
Shoubridge, H. O. (C.E.)	... Nasik.
Silvester, C. J.	... Moradabad, U. P.
Sim, E. L.	... Bombay.
Simcox, A. H. A. (I.C.S.)	... Jalgaon, Khandesh.
Simonds, Capt. M. H.	... Ferozepore.
Simpson, J. Hope (I.C.S.)	... Gorakhpur, U. P.
Simson, Lt. R.	... Fyzabad.
Sinclair, R. L.	... Srinagar.
Sind Club, The Hony. Secretary ...	... Karachi.
Sitwell, Capt. N. S. H. (R.A.)	... Dum Dum.
Skelton, J. H.	... *Europe.*
Skilling, W.	... *Europe.*
Skinner, Capt. J. M. (I.M.S.)	... Ganjam.
Skinner, Capt. R. B. (R.E.)	... Dagshai.
Skinner, R. R.	... Fort Bilaspur.
Slade, G. E. R.	... Sabarmati.
Slade, Rear-Admiral Sir E. J. Warre....	... Ceylon.
Sladen, Dr. R. J. L.	... *Europe.*
Slater, H. Kelshall	... Bangalore.
Slater, J. Sanders	... Bombay.
Smallwood, H. St. C.	... Thabeitkyn, U. Burma.
Smales, Chas. B. (I.F.S.)	... Tharrawadi.
Smart, Dr. A. G. M. (M. B.)	... Kelanton, *via* Singapore.

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Smith, A. Kirke	... Bombay.
Smith, J. H.	... Cutch, Bhuj.
Smith, J. J. (I.C.S.)	... Koraput, Vizagapatam Dist.
Smith, Major F. A. (I.M.S.)	... Bharatpur.
Smith, Capt. H. H....	... Fyzabad.
Smith, Major O. A.	... Alipore.
Smith, S. D. (B.A.)	... *Europe.*
Smith, W. J.	... Colombo.
Smythies, E. A.	... Naini Tal.
Somers, W. B. (M.B.)	... Rangoon.
Snow, Lt.-Col. E. Graham	... Peshawar.
Souter, C. A. (I.C.S.)	... Madras.
Southon, Capt. C. E. (I.M.S.)	... Bombay.
Spalding Capt. W. B.	... Cawnpore.
Sparke, W.	... Rangoon.
Sparling, A. H.	... *Europe.*
Spence, A. D.	... Rangoon.
Spence, R. A.	... Bombay.
Spooner, T. J. (C.E.) (Life Member) ...	... Gadag.
Squire, D.	... Tellicherry.
Stables, Major Alex. (R.A.M.C.) ...	... *Europe.*
Stack, Mrs. C. E.	... *Europe.*
Stallard, R. H. (R.E.)	... Sialkot.
Stanbridge Capt. W. J.	... Kasauli.
Standen, B. (I.C.S., C.I.E.)	... Pachmarhi.
Stanton, W. C.	... Bombay.
Staples, E. W. H. (C.E.)	... Dum Dum.
Stebbing, E. P. (I.F.S., F.L.S., F.E.S., F.Z.S.)	... *Europe.*
Steel, Capt. D. (I.M.S.)	... Bombay.
Steen, Capt. R. (I.M.S.)	... Mainpuri, U. P.
Steffen, O.	... Bombay.
Stephens, L. B.	... Karachi.
Stevenson, Lt. F. (I.M.S.)	... Manipur State.
Stevenson, Hon'ble Surg.-Genl. H. W....	... *Europe.*
Stevens, Herbert	... Lakhimpur, Assam.
Stevenson, Capt. W. D. H. (I.M.S.) ...	... Bombay.
Stewart, Capt. G. H. (I.M.S.)	... Rangoon.
Stewart, Capt. J. M.	... Bombay.
Stirling, J. H.	... Jodhpur, Rajputana.
Stockley, C. H.	... Belgaum.
Stockley, Capt. J. P.	... Kotra, Rajputana.
Stokes, I. W.	... Bombay.
Stoney, E. W., C.I.E.	... Coonoor.
Stoney, R. F.	... Madras.
Stonor, W.	... Nagasamudram, S. M. Ry.
Storey, Thos. H.	... Oodeypur.

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Story, S. S. ... ... *Europe.*
Street, E. ... ... Mandalay.
Stringfellow, H. P. ... ... Bombay.
Strong, F. W. (I.C.S.) ... ... Dinajpur.
Strong, R. P. W. ... ... *Europe.*
Stuart, Capt. C. Kennedy-Crawford, F.Z.S. ... Myitkyina, Burma.
Stuart, C. J. ... ... Nellore.
Stuart, G. A. D. (I.C.S.) ... ... Saidapet.
Stuart, J. D. ... ... Minbu.
Stubbs, L. M. (I.C.S.) ... ... Muttra Cantt.
Sullivan, Col. G. D. F. ... ... *Europe.*
Sullivan, E. H. ... ... Madanapalli.
Surveyor, Dr. N. F. (M.D.) ... ... Bombay.
Suter, Dr. M. F. ... ... Bombay.
Swinhoe, Col. C. ... ... *Europe.*
Sykes, Major C. A. (R.H.A.) .. .. Bangalore.
Sykes, C. M. (C.E.) ... ... Dwarka.
Sykes, M. G. (I.C.S.) ... ... *Europe.*
Sykes, Sir Tatton, Bart. ... ... *Europe.*
Symes, W. C. ... ... Bombay.
Symons, H. (R.G.A.) ... ... Kirkee.
Symons, C. T. ... ... Colombo.

Talbot, W. A. (I.F.S.) ... ... Kirkee.
Tambe, Dr. Gopal Ramchandra (M.A., B.SC., L. M. & S.). Indore, C. I.
Tanner, Major C. O. O. ... ... Karachi.
Tata, Sir Dorabji J. (Life Member) ... ... *Europe.*
Taylor, H. W. O. (B.SC. A. M.I.C.E.) ... ... Satara.
Taylor, Capt. J. ... ... Bombay.
Taylor, James H. ... ... *Europe.*
Tejpal, Goverdhandas Goculdas (Life Member) ... Bombay.
Tenison, Lt. W. P. C. (R.F.A.) ... ... Nowshera, Punjab.
Tennant, G. F. D. ... ... Bombay.
Tew, G. C. (I.C.S.) ... ... Pyinmana.
Thom, W. S. ... ... Paletwa, Aracan Hill Tracts.
Thomas, E. F. (I.C.S.) ... ... Palghat, Malabar.
Thomas, F. B. ... ... Kanchrapara, E. B. S. Ry.
Thomas, M. P. ... ... Orissa.
Thomasset, H. P. ... ... Seychelles.
Thompson, Miss A. ... ... Betul, C. P.
Thompson, R. H. E. (I.F.S.) ... ... *Europe.*
Thompson, Major W. G. (R.H.A.) ... ... *Europe.*
Thomson, Lt.-Col. Henry (I.M.S.) ... ... Madras.
Thomson, Major D. B. ... ... *Europe.*
Thomson, Capt. W. M. (I.M.S.) ... ... Chaubattia, U. P.

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Thornton, H. A. (I.C.S.) ... ... Lashio, Shan States.
Thornton, Capt. F. E. ... ... Transvaal.
Thorpe, Capt. L. L. G. (R.A.M.C.) ... ... *Europe.*
Thring, Lt.-Col. R. H. D. ... ... Jubbulpore.
Thruston, L. A. ... ... Mandalay.
Thubron, J. B. S. ... ... Nasik.
Thullier, Capt. L. C. (I.A) ... ... Bombay.
Tibbs, Rev. P. G. ... ... Bombay.
Tilly, T. H. (Life Member) ... ... Rangoon.
Tinley, Col. G. F. N. ... ... Meerut.
Tipper, G. H. (B.A.) ... ... Calcutta.
Tipping, P. G. ... ... Sidapur, Coorg.
Tod, Alex. M. ... . Bombay.
Tomkins, Major E. L. (R.A.) ... ... Jubbulpore.
Toppin, S. M. (R. A.) ... . Drosh, Chitral.
Tottenham, W. F. L. (I.F.S.) ... . Pokokku, Burma.
Townsend, Major E. C. ... ... Akyab, Burma.
Traill, W. H. ... . *Europe.*
Travancore, H. H. The Maharaja Sir Sultan Rama Raja Bahadoor (G.C.S.I., G.C.I.E.) (Life Member). Trivandrum.
Treeby, H. F. ... ... Ambala.
Trench, C. G. C. (I.C.S.) ... ... Damoh, C. P.
Trevor, C. G. (I.F.S.) ... ... *Europe.*
Trevor, Surg.-Genl. F. W. (R.A.M.C.) ... ... Calcutta.
Trivandrum, The Director, Government Museum and Public Gardens ... ... Trivandrum.
Trotter, E. W. ... ... Bangkok, Siam.
Troup, N. F. T. ... ... Kousanie, Almora.
Troup, R. S. (I.F.S.)... ... ... Dehra Dun.
Truninger, L. ... ... Calcutta.
Turkhud, Dr. D. A.... ... ... Bombay.
Turner, A. J. (B.SC.) ... ... Bombay.
Turner, Sir Montague ... ... *Europe.*
Tweedie, A. G. ... ... Calcutta.
Tweedie, Lt. J. L. ... ... *Cairo.*
Twiss, Capt. A. M. (R.E.) ... ... Kirkee.
Tyabji, S. B. ... ... Hangal, Dharwar District.
Tyler, H. H. F. M. (I.C.S.) ... ... Waltair.
Tyrrell, Major J. R. (I.M.S.) ... ... Sirdarpore, C. I.
Tytler, Maj. H. C. ... ... Manipur.

Ulwar, H.H. Maharaja Sawai Jaisingh Bahadoor (K.C.S.I.) (Life Member) ... ... Ulwar, Rajputana.
United Service Club, The Secretary ... ... Bangalore.
United Service Library, Hon. Secretary ... Poona.
Unwalla, J. N. (Life Member)... ... ... Bhavnagar.

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Urwin, Capt. J. J. ... ... Motihari, B.-N. Ry.
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Vakil, J. D. ... ... Bhavnagar.
Varvill, M. N. ... ... Bombay.
Vaughan, W. (F.E.S.) (Life Member) ... ... Ceylon.
Venning, F. E. W. (Life Member) ... ... Monywa, U. Burma.
Venour, Major W. E. (I.A.) (Life Member) ... Kohat.
Vernon, C. V. (I.C.S.) ... ... Hyderabad, Sind.
Vernon, H. A. B. (I.C.S.) ... ... Madras.
Victoria College, The Principal ... ... Palghat.
Victoria Technical Institute, The Curator and Librarian ... ... Nagpur.
Vidal, H. S. G. ... ... Bombay.
Villar, A. R. ... ... Tharrawaddy.
Vincent, W. H. H. (I.C.S.) ... ... Mozafferpore.
Vithuldas Damodhar Thakersey, The Hon'ble Sir.... Bombay.
Vlasto, P. ... ... Bombay.
Volkart, L. ... ... Bombay.

Waddington, T. H.... ... ... Phillaur, Punjab.
Wadia, D. N. (Prof. of Biology, P. W. College, Jammoo) ... ... Kashmir.
Wadia, M. M. ... ... Bombay.
Wainwright F. M. ... ... Gudivada, Kistna.
Waite, H. W. ... ... Ferozepore.
Wakefield, G. C. E. ... ... Hyderabad, Deccan.
Walker, Major G. K. (A.V.D.)... ... ... London.
Walker, J. S. E. ... ... Purnahia, Bengal
Walker, Capt. W. B. (R.A.) ... ... Quetta.
Wall, Major F. (I.M.S., C.M.Z.S.) ... ... Almora.
Wall, W. ... ... Punjab.
Wallace, John (C.E.) ... ... Bombay.
Wallace, R. ... ... *Europe.*
Wallace, W. V. (I.C.S.) ... ... Burma.
Wallinger, W. A. ... ... Satara.
Wallis, R. W. D. ... ... Mingin, Burma.
Walsh, E. P. (I.C.S.) ... ... *Europe.*
Walsh, W. ... ... Burma.
Walton, Major H. J. (I.M.S., C.M.Z.S.) ... ... Bombay.
Warburton, H. G. (I.C.S.) ... ... Lucknow.
Ward, Col. A. E. ... ... *Via* Haldwani, R. and K. Ry.
Ward, Major C. H. ... ... Colombo.
Ward, W. ... ... Ootacamund.
Wardrop, Capt. A. C. ... ... Mhow, C. I.
Ware, F. ... ... Madras.
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Watson, Capt. H. R.	... Bangalore.
Watson, H. W. A. (I.F.S.)	... Taunggyi, Burma.
Watson, Major J. W. (I.M.S.)... ...	... Seistan.
Watson, W. M.	... *Europe.*
Watts, Capt. G. A. R.	... Quetta.
Watts, N. H. L.	... Mandalay.
Webb, G. R.	... Bombay.
Webb, M. (I.C.S.)	... Hyderabad, Sind.
Webster, J. R.	... Bombay.
Webster, Sub.-Lieut. D. (R.N.) ...	... *Europe.*
Welchman, G. H.	... Ganjam.
Weldon, W. L.	... Bombay.
Weller, A. O.	... Kanchrapara, E. B. S. Ry.
Wells, F. W. A.	... Pyawbwe, U. Burma.
Wells, Dr. H. E. (M.B.)	... Minbu.
Wells, Capt. R. T. (I.M.S.)	... Bombay.
Welman, P. H.	... Bombay.
Wenden, H. (C.E., C.I.E.)	... *Europe.*
Weston, A. T.	... Hminelongyce, L. Burma.
Weston, W. V.	... Ahmadpur.
Whalley, G. P.	... Saidpur.
Whately, Richard	... Ajmer, R.-M. Ry.
Wheatley, Major P. (R.F.A.)	... Mhow, C. I.
Whiffin, D.	... Rourkela, B.-N. Ry.
Whistler Hugh	... Rawalpindi.
Whitcombe, Major E. G. R. (I.M.S.) ...	... Jhansi.
White, Capt. A. W.	... Jask, P. Gulf.
White Colin, R.	... Trichinopoly.
White, C. R.	... Shwebo, Burma.
White, Chas. W.	... *Europe.*
White. C. A.	... Taraghur.
White, W. T.	... Rangoon.
White, W. P.	... Bhandara, C. P.
Whitehead, Capt. C. H. T.	... *Europe.*
Whitehead, John (I.F.S.)	... Jhansi, U. P.
Whitehead, Major J. H.	... *Europe.*
Whittall, Lieut. G.	... Malapuram.
Whittall, Brigade-Col. F. V.	... *Europe.*
Whitworth, G. C. (Life Member) ...	... *Europe.*
Whymper, S. L.	... *Europe.*
Wickham, H. C.	... *Europe.*
Wickham, P. F. (C.E.)	... Rangoon.
Wiles, G. (I.C.S.)	... Broach.

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Williams, J. K.	... Bijapur.
Williamson, K. B. ...	... Jubulpore, C. P.
Williamson, W. J. F.	... Bangkok, Siam.
Willis, R. A.	... Bombay.
Willock, Comdr. A. R. G. (R.I.M.) ...	... Akyab.
Wilson, Major Alban	... Shillong, Assam.
Wilson, A. R.	... Almora, U. P.
Wilson, W. B.	... *Europe.*
Wilson, A. T.	... Muhammerah, Persian Gulf.
Wilson, C. C.	... Coimbatore.
Wilson, Lt.-Col. C. H. L. F. (R.A.) ...	... Rawal Pindi.
Wilson, H. C.	... Madras.
Wilson, P. N. W.	... Jubbulpore.
Wilson, R. A. (I.C.S.) ...	... *Europe.*
Wilson, William Burns	... *Europe.*
Wimbush, O. C. B.	... *Europe.*
Wimbush, A.	... Nilambar, Malabar.
Winsor, D. W.	... Sirur, Poona.
Withinshaw, L.	... Ramnad.
Withers, D. S.	... Assam.
Witt, D. O. (I.F.S.)	... Saugor, C. P.
Wood, C. W. (C.E.)	... *Europe.*
Wood, Capt. H. (R.E.)	... *Europe.*
Wood, Major H. S. (I.M.S.)	... Calcutta.
Wood, S. C. G.	... Ajmere.
Woodhouse, E. J.	... Sabour.
Wooster, W. G.	... *Europe.*
Worgan, Capt. R. B.	... Madras.
Wright, A. J.	... Travancore.
Wright, Lt.-Col. E. H. (I.M.S.) ...	... Madras.
Wright, F. A. (C.E.)	... Calcutta.
Wright, H. C.	... *Europe.*
Wright, J. M. (I.C.S.)	... Shwebo, Burma.
Wright, Capt. W. D. (I.M.S.)	... *Europe.*
Wrigley, F. A.	... Rangoon.
Wroughton, R. C. (F.Z.S.) (Life Member)	... *Europe.*
Yeo, Edwin W.	... Bombay.
Yerbury, Col. J. W. (R.A.) (Life Member)	... *Europe.*
Younan, Lt.-Col. A. C. (I.M.S.) ...	... *Europe.*
Young, E. H.	... Bandikui.
Young, F. B.	... *Europe.*
Young, H. G.	... Ferozepore.
Young, J. V. (I.F.S.)	... Pyinmana, Burma.

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Young, Capt. M. J. D. ... ...Secunderabad.
Yule, Capt. R. A. ... ...Hyderabad, Deccan.

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BOMBAY NATURAL HISTORY SOCIETY.

STATEMENT of ACCOUNTS (from 1st January 1910 to 31st December 1910).

RECEIPTS.	Rs. a. p.	Rs. a. p.
Balance in Bank on 31st December 1909...	2,253 10 5	
Cash in hand on 31st December 1909 ...	179 0 0	
Petty Cash Balance on 31st December 1909	23 14 5	
Postage Balance on 31st December 1909...	0 12 0	
		2,457 4 10
Subscription for 1907 (in arrears) ...	30 0 0	
" 1908 " ...	75 0 0	
" 1909 " ...	722 10 0	
" 1910 " ...	18,955 12 6	
" 1911 (in advance) ..	2,659 13 1	
" 1912 " ...	29 12 3	
" for Life Membership ...	400 0 0	
		22,872 15 10
Entrance Fees		2,690 0 0
Government of Bombay's grant-in-aid		5,000 0 0
Sundries		1,240 10 7
Sale of Journals		1,240 7 3
Sale of Duck Book and Plates...		2,717 15 0
Interest on Investments...		1,353 11 6
Interest allowed by the Bank		92 9 10
Total Rs. ...		39,665 13 10

EXPENDITURE.		Rs. a. p.
Rent of the Rooms from 1st January 1910 to 31st December 1910		1,890 0 0
Salaries of the Staff		7,882 15 9
Postages		1,331 4 3
Printing and Stationery		929 1 7
Journal Account		9,857 14 7
Library		1,008 1 3
Furniture		1,134 11 0
General Charges		3,427 6 8
Investments		7,982 3 2
Sundries		791 13 4
Bank's Charges		90 15 0
Duck Book		378 12 9
	Rs. a. p.	
Balance in Bank on 31st December 1910.	2,729 13 0	
Postage Balance on 31st December 1910.	46 10 9	
Petty Cash on 31st December 1910 ...	38 14 2	
Cash in hand on 31st December 1910...	145 5 0	
		2,960 10 11
Total Rs. ...		39,665 13 10

Examined and found correct.

(Sd.) A. F. FERGUSON & Co.,
Chartered Accountants.

(Sd.) L. H. SAVILE,
Hony. Treasurer.

BOMBAY, 28*th March* 1911.

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A BIBLIOGRAPHY OF THE BOTANY OF BRITISH INDIA AND CEYLON.

BY

E. BLATTER, S. J.

The idea of compiling a list of books and papers on Indian Botany first came to my mind some eight years ago when I came out to India and was quite at a loss to ascertain what had been published on the vegetation of this vast country. What was left in my memory of the study of the history of Botany was the vague idea that, once upon a time, some enterprising botanists and explorers had lived and worked and died under the tropical sun of Hindustan, that some of them had sent huge collections to various museums in England and France and Germany, and that others lived long enough, to commit their observations to writing, whilst a few of them had to be satisfied with the fame of posthumous publications. But most of the names had escaped me; of some indeed I remembered the names exactly, but I did not quite recollect, what the bearers of the names had been doing, and of a great number who, I was sure, must have existed, I knew neither the one nor the other.

In the course of time I made the discovery (which was not a little consoling to me) that a great many of my botanical colleagues had to confess a similar ignorance. Under these circumstances it was indeed gratifying to receive inquiries like these from various parts of India: 'Could you recommend me a concise book dealing with the Botany of Rajputana?' or: 'I should be much obliged for a list of botanical books which have been issued on the flora of Hyderabad', or some other time: 'If it is not causing too much trouble, I wish to ask you, which authors described best the mosses of Southern India?' or: 'I should like to buy a book which treats exhaustively of the fungi of the Deccan.'

These and similar questions set me ahunting after the botanical literature of India. But this is not an easy task in a country,

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where the libraries are few and where these few libraries have no special tendency towards developing a scientific taste in the minds of their subscribers. As I had no opportunity of consulting the library in Calcutta, I had to drop the idea of getting up a list of works on Indian Botany which might be called somewhat complete, and it was only after my return to Europe that I was able to work up the bibliography to the present state, in which I wish to present it to my colleagues in India and Europe. Imperfect though it may be in many respects, I feel confident that the list, even in this form, will be welcome to many workers in Indian Botany, because, as far as I know, no attempt to supply the need has been made up to the present.

I considered it convenient to include a good many papers which appeared in the publications of the Indian Departments of Agriculture and Forestry, as well as papers from pharmaceutical and horticultural journals. But I omitted all those which treat exclusively of the specific technical side of the respective branch of science. Opinions may, therefore, be divided in many cases as to the advisability of including or excluding a certain paper. I have, besides, catalogued some of the more important monographs, dictionaries, etc., which, though they do not deal exclusively with Indian Botany, contain, nevertheless, valuable information on the subject.

As to the arrangement of the bibliography I have, after long consideration and on the advice of friends interested in it, decided to divide the whole list into two parts.

The first part (I) is to contain publications which treat of the Botany of India in general or of a greater part of India. It will also contain descriptions of single species which are not confined to a very limited locality and papers on plants of extensive cultivation (whether indigenous or not), though they may be restricted to well defined areas.

The second part (II) will enumerate the books and papers describing the Botany of smaller areas which are included entirely or at least for the greater part in one of the botanical regions recognised at present in India, *viz.*: The Eastern Himalayas, the Western Hymalayas, the Indus Plain, the Gangetic Plain,

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Malabar, the Deccan, Ceylon and Burma. To these will be added, under separate headings, the botanically little known countries of Baluchistan and Nepal. For practical reasons we shall follow the alphabetical arrangement of the regions:

1. BALUCHISTAN.
2. BURMA, comprising Upper and Lower Burma, Chittagong and Assam of the old maps [1].
3. CEYLON, including the Maldive Islands.
4. DECCAN, comprising the whole table-land of the Peninsula east of Malabar and south of the Gangetic and Indus Plains. We include the Coromandel Coast.
5. EASTERN HIMALAYA, extending from Sikkim to the Mishmi Mountains in Upper Assam.
6. GANGETIC PLAIN, comprising the United Provinces and Bengal (except Chota Nagpore and Orissa), extending eastwards to the Burmese botanical region.
7. INDUS PLAIN, including the plains of the Punjab, Sind, Rajputana, Cutch, and Gujarat (to the Narbada River).
8. MALABAR, comprising Gujarat (south of the Narbada), the Konkan, Kanara, Malabar proper (with Nilgiris and Palni Hills), Cochin, Travancore, and the Laccadive Islands.
9. NEPAL.
10. WESTERN HIMALAYA, extending from Kumaon to Chitral.

Part II will enable the botanist residing in any part of India to find out without great trouble what has been published on the vegetation of his respective district.

I shall be thankful for any additions, corrections or suggestions which may help to make the bibliography more useful than it is, perhaps, in its present form. It is quite possible that the practical use of the list will reveal some deficiencies.

I wish to express my thanks to Mr. H. N. Dixon who kindly supplied me with a list of publications on Indian Mosses, and to the Rev. F. Theissen, S. J., who helped me with regard to the mycological flora. My thanks are also due to the Librarians of the Peradeniya Botanic Gardens and of the South Kensington Natural History Museum.

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[1] The plains of Assam and Sylhet do not properly belong to this botanical region; but other considerations induced us to include them here. Our regions serve in this place a practical and not a strictly scientific purpose.

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THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. Stuart Baker, F.L.S., F.Z.S., M.B.O.U.

INTRODUCTION.

It is now nearly 8 years since the conclusion of "Indian Ducks and their Allies" and the favourable reception accorded to that series has induced me to compile, and the editors of the Journal to accept, a further series of articles upon the remaining Game Birds of India.

Of necessity a work of this nature must be more of a compilation than original, but at the same time every effort will be made to bring each article up-to-date and we trust that much matter which has as yet found no record will here obtain a place.

In writing "Indian Ducks" I observed in the preface that the articles were written as much for the purpose of inducing sportsmen in the future to record their experiences and observations as with the object of putting together an epitome of what was already known. The former purpose has, I think, been fully achieved and much valuable information upon Indian Ducks has been recorded since the articles were written. We have added no little to our knowledge of their distribution and habits and have actually obtained a record adding Bewick's Swan to our List of Indian Birds.

So with the following pages. We trust that while the compilations will show sportsmen and field naturalists the extent of present records it will encourage them to furnish others which will not only supplement but also correct them when necessary.

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It will be seen that much yet remains for sportsmen and field naturalists to do. Doubtless there are yet to be obtained additions new not only to an Indian Avifauna but to science altogether by those who have the good fortune to be posted on our far North-Eastern Frontier. But novelties are not the only things to hope for and there is much about the most common of our game birds which has not yet been properly, and sufficiently worked out. It is only within the last few weeks that Mr. Ogilvie-Grant has submitted the entirely new theory that female Woodcocks enormously outnumber the males and in the same article he has knocked on the head our old ideas as to the alleged differences in plumage between the young and old birds.

As regards classification that of Blanford's Avifauna will be adopted almost as it is, but for the sake of convenience it may be necessary to alter the sequence of the individual birds and indeed, in some cases, of the Families or Sub-Families also.

The keys to the species are based as far as possible upon such characteristics as appeal to the non-scientific observer but in each case the fullest description of the adult male and female is given as also, where possible, of the young bird.

Finally I may add that should these series prove as popular as did the "Ducks" it is proposed to bring them out in book form on the same lines as that adopted for those articles.

Part I.

Family—CHARADRIIDÆ.

In 1886 in the "Ibis," page 122 *et seq.*, Seebohm thus discoursed on the position of the Snipes in the great family of "Plovers." "The Snipes belong to the family Charadriidæ, which also includes the Sandpipers, Curlews, Plovers and a few other allied genera. From all these birds they are very easily and very distinctly characterised. Most of the Charadriidæ are web-footed; they have a distinct web at the base of the toes, sometimes much more developed between the outer and the middle toe; but the Snipes, some of the Sandpipers, and the Turnstones are exceptions to this rule, having no rudimentary web between any of the toes, which are cleft to the base. Again, most of the Charadriidæ have comparatively long legs and short bills; the Snipes on the contrary have short legs and long

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bills. The only birds in this family (except the Snipes) in which the bill is as long or longer than twice the length of the tarsus, are the females of one or two species of Curlews and one or two species of Sandpiper, none of which have all the toes cleft to the base. The genus Scolopax may therefore be diagnosed as follows :—

> "Charadriidæ having the bill twice as long as the tarsus, and all the toes cleft to the base."

He, however, comes to the conclusion in this paper that one cannot divide the group into genera and that these species must all come under the one genus *Scolopax*.

He first shews that they cannot be divided by any structural diagnosis, the two main points of which may be said to be the amount of feathering on the tibiæ and the number of tail feathers.

He, however, points out that there are two characteristics which divide five members of the group from all others, *viz.*, the nature of the markings on the head and the curious silvery tips to the feathers of the tail underneath.

These characteristics appear quite sufficiently satisfactory and it is upon these that most naturalists now divide the genera Scolopax and Gallinago.

Subfamily—SCOLOPACINÆ.

The members of this Subfamily may be distinguished from all other birds of the Charadriidæ Family by having no trace of a web between the toes and by having the bill about twice as long as the tarsus. Another striking feature of the Snipes is the curious position of the eyes which are placed very far back in the head just above the anterior edge of the ear-orifice. In this country we have three genera. *Scolopax*, which contains the Woodcock only, *Gallinago*, containing the true Snipes, and *Rostratula* containing the birds generally called Painted Snipes. The genus Scolopax includes, according to Sharpe, only two species, *viz.*, *rusticula* and *saturata*. The former, the common Woodcock, is migratory summering in the Himalayas and extending in the winter to the Plains of India ; the latter is found only in Java and New Guinea and but little is known about it. Of the genus *Gallinago* Sharpe recognizes 20 species some of which are migratory and some are not ; of these seven species and one doubtful sub-species (*raddei*) are found in India. The genus

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Rostratula is non-migratory and contains three species of which one, the Common Painted Snipe, is found over most of India and Burmah as well as China, Japan and Africa.

Blanford's key to the genera is as follows :—

A.—Sexes similar in plumage, bill straight.

(*a*) Tibia feathered throughout ; no longitudinal pale stripes ; occiput and nape transversely striped ..... *Scolopax.*

(*b*) Tibia partly naked, longitudinal pale stripes on crown and scapular..... ... *Gallinago.*

B.—Sexes different, bill curved downwards at tip ..... *Rostratula.*

The sportsman can always tell the Painted Snipes (*Rostratula*) at a glance by its bright colouration, so different in every way from an ordinary Snipe's plumage.

The Woodcock he can tell, not only by its weight and size, but by a glance at the under surface of its tail feathers and if these have silvery tips then the bird is a Woodcock. Again if the occiput and nape are found to be barred, and not streaked, in the character of their markings the bird is the same.

SCOLOPAX RUSTICOLA.

The Woodcock.

Scolopax rusticola.—Linn., Sys. Nat., I, p. 243 (1766); Blyth, Cat., p. 271 ; Jerdon, B. I., III., p. 670 ; Stoliczka, J. A. S. B., XXXVII, Pt. 2, p. 70 ; Beavan, Ibis, 1868, p. 391 ; Brooks, J.A.S.B., XLIII, Pt. 2, p. 253 ; Hume, S.F., II, p. 482 ; Anderson, *ibid*, III, p. 356 ; G. Austin, J.A.S.B., XLV, Pt. 2, p. 200 ; Fairbank, S.F., V., p. 409 ; Butler, *ibid*, p. 504 ; Hume and Davison, *ibid*, VI, p. 458 ; Ball, *ibid*, VII, p. 228 : Laird, *ibid*, p. 470 ; Hume, *ibid*, p. 483 ; *id.* Cat. No. 867 ; Bingham, S.F., VIII, p. 196 ; Scully, *ibid*, p. 353 ; Hume, and Marshall, Game B., III, p. 309 ; Williamson, S.F., X., p. 517 ; Barnes, B. of Bom., p. 343 ; Seebohm Charadriidæ, p. 502 ; Hume, S.F., XI, p. 318 : Newnham, Bom. N. H. S. Journal, Vol. IV, p. 52: Osmaston, *ibid*, Vol. XI., p. 473 ; Davidson, *ibid*, Vol. XII, p. 66 ; Stuart Baker, *ibid*, p. 500 ; Evans, Ibis, 1891, p. 80 ; Meade-Waldo, *ibid*, 1893, p. 204 ; Schufeldt, *ibid*, p. 653 ; Davidson, *ibid*, 1898, p. 39 ; Finn., Indian Waders, p. 138.

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Scolopax rusticula.—Wharton, Ibis, 1879, p. 453 ; *id*, S.F. VIII, p. 500 ; Legge, B. of Ceylon, p. 806 ; Butler, S.F. IX, p. 428 ; Biddulph, Ibis, 1881, p. 95 ; Scully, *ibid*, p. 588 ; Marshall, Ibis, 1884, p. 424 ; Davison, S.F. X., p. 413 ; Oates, Birds of B. B., II, p. 380 ; St. John, Ibis, 1889, p. 176 ; Hume's, Nests and Eggs, 2nd Edit., III, p. 349 ; Sharpe, Cat. B. B. M., XXIV, p. 671 ; Blanford, Fauna B. I., IV, p. 283 ; Dresser, Pal. Birds, p. 726 ; Oates, Cat. B. Eggs of B. M., Vol. II, p. 66 ; Sharpe, Hand List of B., Vol. I, p. 166 ; Oates, Game B., II, p. 428 ; Inglis, Bom. N. H. S. Journal, Vol. XII, p. 500 ; Bourdillon, *ibid*, Vol. XVI, p. 10 ; Fulton, *ibid*, p. 63 ; Rattray, *ibid*, p. 663 ; Ogilvie-Grant, Bulletin, B. O. Club, CLVI (1st Jan. 1910).

Vernacular names.—*Simtitar*, *Tutitar*, Hin. ; *Sim Kukra*, Kumaun and Nepal ; *Chinjarole*. Chamba ; *Daodidap gadeba*, Cachari ; *Simpoo-khlaw*, Khasia ; *Kangtruk*, Manipur ; *Wilati Chaka*, Chittagong ; *Bumpal* or *Dhábhá*, Chitral ; *Gherak*, Drosh ; *Chustruck*, Gilgit.

Description.—Forehead and sinciput grey, generally with a dark mark on the forehead. Occiput and nape with three broad transverse bands of velvet black, divided by yellowish or rufous lines. A deep rufous brown, almost black, line running from the base of the bill to the corner of the eye ; a second similar line below eye and posterior ear coverts; ear coverts and cheeks grey, with numerous rufous-brown spots. Upper parts and wing coverts rufous grey with numerous bars of brown and rufous ; the lesser wing coverts brown and rufous only and the scapulars broadly black on the inner and white, yellowish white or pale grey on the outer webs. The primary coverts are rufous, with bars of grey, finely edged with dark brown. The primaries and outer secondaries brown, the latter notched on the outer webs with rufous, the notches being palest on the outermost feathers. The quills are also margined with pale rufous at the tips. The inner secondaries are barred right across with alternate bands, broad of brown and narrow of rufous. Rump and upper tail coverts barred rufous and black or rufous and brown ; as a rule in the longest coverts the terminal half is almost pure rufous.

Tail feathers dark brown or black, notched or barred with rufous and tipped grey above and broadly silver-grey below.

Chin white or nearly so, remainder of lower parts dull greyish

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white, barred throughout with narrow rufescent bars which become darker and more numerous on the upper breast, often running into one another and forming dark patches. On the abdomen and flanks posteriorly, the bars are sometimes centred with a paler tint.

The adult female does not differ from the male in plumage. "The female is larger with the colours more dull" (Jerdon). "Males have . . . . . the back more of the pale brown and grey, and the rump less red than the female" (Yarrell), *i.e.*, Yarrell makes out the female to be a more rufous bird than the male.

Young birds.—"Differ from the adult in being darker and having creamy-whitish, instead of ashy, spots at the end of the dorsal and scapular feathers; the lower back, rump and upper tail coverts are plainly barred across with dusky brown, and the tail feathers are not largely notched with sandy brown on their margins, but have a narrow sub-terminal line of sandy buff between the ashy tip and the black of the rest of the feathers. The outer web of the primaries has a distinct series of fulvous notches." (Sharpe).

The question of the alleged differences in the young bird have been taken up lately by Ogilvie-Grant and in the B. O. C. Bulletin he thus sums up the result of his observations. "It will thus be seen that . . Gould . . implies that the Woodcocks with tooth-like markings on the outer web of the first long flight-feathers are the young birds of the year."

"This statement has been generally accepted as correct."

"The investigations which I have undertaken during the last few years have clearly proved the entire fallacy of this theory."

He then explains how he shot many breeding birds in the Azores—an unfortunate but necesssary proceeding—and also obtained young birds of the year from Messrs. Meade-Waldo and Sir Richard Graham.

Ogilvie-Grant then comments on Seebohm's description of the differences between the young and the old bird and says that his investigations have "clearly proved that it is impossible to distinguish between the plumage of the male and female Woodcock, or between old and young birds of the year, when once the latter have fully developed their flight feathers."

Nestlings.—"Covered with a velvety down of a rufous colour with a broad band of chestnut down the centre of the crown, and another down the centre of the back, with three broad transverse bands down the

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sides of the body ; on each side of the crown and dorsal stripe a broad streak of isabelline ; a black loreal line and a central streak on the forehead also black ; under surface of body pale rufous, inclining to isabelline on the abdomen, and with some chestnut patches on the throat and foreneck." (Sharpe.)

Iris deep brown, almost black. Feet green-grey or livid grey, or grey lead colour, claws generally paler and more fleshy. Bill dusky, base brown, paler and tinged with purple at the base of the lower mandible

"The legs and feet are pale bluish, brown or drab, or fleshy plumbeous or grey, or livid grey, or bluish fleshy grey, generally more or less shaded dusky on the joints ; and the claws are fleshy brown, pale brown, blackish brown or dusky."

"The bill is dusky to blackish brown at tip, the rest pale drab brown, fleshy brown with a bluish tinge or almost plumbeous ; often nearly white, or fleshy white at the base of the lower mandible." (Hume.)

Dimensions.—"Length 13·0 to 15·0 ; wing 7·2 to 8·0 ; tail from vent 3·0 to 3·85 ; tarsus 1·35 to 1·57 ; bill from gape 2·8 to 3·3 : weight 7 oz. to 12·5 oz." (Hume.)

"Total length 15 ins., culmen 2·85 ; wing 7·5 ; tail 3·5 ; tarsus 1·55." (Sharpe.)

"*Adult female.*—Total length 14 ins., culmen 3·2, wing 7·3, tail 2·9, tarsus 1·4" (Sharpe.)

The Indian birds which I have examined from the Indian Museum and the B. N. H. Society's Museum and other skins sent me from Madras and Kashmir are as follows in their dimensions :—

Males.—Culmen 2·7″ to 3·1″ ; wing 7·30″ to 8·30″ ; tarsus 1·50″ to 1·80″.

Females.—Culmen 2·90″ to 3·25″ : wing 7·20″ to 8·50″ ; tarsus 1·40″ to 1·80″.

The question of comparative size of the two sexes is one which has been very much discussed and the law has been laid down by various authorities in various ways. Thus Jerdon says that the female is the larger bird of the two, Sharpe makes out that it is a much smaller bird with a longer beak. Hume sums up his opinion thus "they show absolutely no constant difference in the size of the sexes." My own opinions support Hume's and I find that though the birds vary

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enormously in size there is no difference in the ranges of size between the sexes. One gets adult males as small as the smallest female and big females as big as the biggest males.

I have made very careful inquiries amongst sportsmen and others concerning the comparative size of the sexes and have found most of them under the impression that one sex or the other—their ideas varied as to which it was—was much bigger than the other. This is undoubtedly due to the fact that it takes a woodcock two years to grow to its full size and the difference in dimensions between a bird of six months old and one of eighteen months is very great.

Another question which has never been settled is the reason or cause of the curious grey phase of colouration so often met with in the Woodcock. The colouration of this variety looks as if it had had all the red pigment washed out of it. I have been unable to explain this myself in any way. I have proved that it is not sexual and I have also ascertained that though it is much more common in young than in old birds it is by no means confined to the former. Major Wilson, to whom I owe thanks for much information and many useful notes, once shewed me two birds shot by him on the same day in Shillong, Khasia Hills, which might have been taken for different species so un-alike were they in tone of colouration. In this case the older, heavier and bigger bird was in the grey phase and, if I remember rightly, both grey and rufous birds were females.

It would appear, therefore, that in India young birds are more frequently grey than are adults but that this phase of colouration is by no means confined to such. In fact I have myself seen fully adult birds almost as grey in tone as the solitary or wood-snipe.

Ogilvie-Grant (in loc. cit.) observes "The Woodcock is more or less dimorphic in plumage, *i.e.*, two more or less distinct phases of plumage are found; some birds have the general colour of the upper part greyer, while in others it is richer and more rufous. The grey phase and the rufous phase occur in both sexes alike, in fully adult birds; but as far as my experience goes, the grey phase is never found among young birds, which are always more or less rufous. These represent what is often described by sportsmen as the smaller rufous "species" of Woodcock."

Ogilvie-Grant in this same paper discusses an apparent disparity in numbers between female and male Woodcocks and notes that out of

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60 Woodcock shot during the breeding season in the Azores only four were females and that out of eleven young birds sent him from Cumberland only one proved on dissection to be of that sex. As, however, he himself remarks, when one goes in for shooting rôding Woodcock it can hardly be expected to get many females (fortunately). As regards the young birds this may be only an exceptional case and it is hardly safe to take this as an example of the general rule.

In India there appears to be no difference in the numbers of the two sexes. Unfortunately in both the Calcutta and Bombay collections we have but few sexed specimens and it is to be hoped sportsmen will help in settling this question one way or the other.

Yet another point about our Indian Woodcock which is unsettled is the question as to whether or not the Indian bird differs in any respect from that found in Europe and Northern Asia.

It has hitherto been considered a generally accepted fact that our Indian Woodcock is a smaller bird than the English but I cannot endorse this. My reasons are as follows. Every one who has studied migration knows that young birds are more erratic in their travels, travel greater distances and to much more unusual districts and countries than the older birds. Now certainly all those Woodcock obtained in the plains and lower hills of India and *possibly all* which are shot south of the Himalayas are birds which are on migration for the cold weather and those which travel furthest and are most often shot are the young birds of the year, hence because the birds we *shoot* are smaller than the average English bird we have come to believe, that the whole race is smaller. This idea is not, however, borne out by my researches which have shown me that fully adult Indian birds are as big as European specimens. Thus I have had two female Woodcocks sent me (*shot off the nests*) which measured in wing 8·30″ whereas my largest bird shot on migration is well under 8·0″.

Hume says that he thinks the Indian bird is smaller than the English but stultifies the value of his opinion by what he says later on, when in talking of the triangular emarginations on the primary quills of the wing, he writes, Yarrell says :—"These marks are indications of youth" and then Hume adds "It is a curious thing that out of 27 Indian-killed specimens now before me, these triangular marks are present in every specimen, only in two or three have they disappeared from the basal half of the feather. Our Museum

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does not contain a single Indian-killed specimen with the whole of the outer web of the first quill entirely plain." From Hume's own words, therefore, we assume that his opinion was formed on a series of immature birds, although his deductions are somewhat upset by Ogilvie-Grant's recent discoveries.

The only way the question can be determined is by the measurement of adult birds in their breeding haunts, either during, or just prior to, the breeding season. Here again the sportsman and field naturalist must come to the fore and assist the scientific man who works in the Museum.

In regard to the weight there is no doubt that the majority of birds shot in India are lighter than those shot in England but the reasons which account for their being smaller would also account for their being lighter. Hume comments on the comparative weight of Himalayan (?) and English birds at some length but his conclusions are hardly convincing especially when one remembers, as has already been shown, that they are based on deductions made from a series of probably immature birds. He says that only 5 birds out of 53 weighed exceeded 10 oz. whilst the weight generally was between 7 and 12½ oz. and he compares this record of weights with a bag made in Ireland.

"In only 5 out of 53 birds has the weight exceeded 10 oz. and of these five the weights were :—10·5, 11·5, 12·0, 12 0, and 12·5 oz. Out of 53½ couple shot . . . . in South-West Ireland, 27 weighed between 12 and 14 oz., 6 between 14 and 15, and one between 15 and 16 . . . . —Our 53 birds weighed, between 7 and 8 oz. fourteen, between 8 and 9 oz. eighteen, between 9 and 10 oz. sixteen, above 10 oz. five. There is an undoubted instance on record of a Woodcock in England weighing 27 oz." I have found it difficult to obtain weights of Indian killed-birds but the few I have obtained of *fully adult* birds do not seem to shew that our birds are much inferior to English, when in good condition and full sized. Thus Major Wilson writes me "I have only weighed one bird as it struck me as being bigger than usual, this weighed 13 oz. and was the bird I sent on to you." Dr. Moore shot birds in Dibrugarh weighing 12, 13, and 14 oz. and Mr. Mondy sent me a bird which weighed just short of 14 oz. Any of them would have equalled good English birds and though the weights are admittedly excep-

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tional for Indian birds this is only because it is also the exception to shoot any but young birds in the plains and Lower Hills of India, whilst even in the higher Hills of Southern India mature birds seem to be but seldom shot.

Dr. W. Moore writes to me anent the weight of his Woodcock as follows :—"The first two I shot, both on the same day, weighed 14¾ ounces each, and though I shot no heavier birds than these afterwards some ran them very close, and of 18 I weighed none were under 12 ounces except one and that was obviously a bird in very poor condition.

I found Woodcock in Dibrugarh on the burnt chapries (grass lands) ear damp forest, feeding on the parched and crippled insects brought to earth by the recent fires."

Distribution.—Outside our Indian limits Seebohm thus describes the habitat of the Woodcock. "Our Woodcock is a semiarctic bird ranging from the Atlantic to the Pacific. In Scandanavia it breeds up to latitude 67, in West Russia to 65, but in East Russia and Siberia not much above 60. Its Southern breeding range extends to the Azores, Canaries, Madeira, the Alps, Carpathians and Caucasus, to the Himalayas (where it breeds at an elevation of 10,000 feet) and to Mongolia and the mountains of Japan. It has not occurred in Iceland or in Greenland, and once only in the Faroes; but accidental stragglers, no doubt driven Westward by storms, principally from the Azores, have been met with on the American Continent, in Newfoundland, New Jersey and Virginia.

Within Indian limits the Woodcock is a resident throughout the Himalayas where it breeds freely above 10,000 feet, and often at even lower elevations. Thence in the cold weather it migrates in considerable number to every portion of the Indian Empire where there are suitable hills and mountains. It has been frequently shot in Ceylon and in the Burmese Hills as far south as Tennasserim, it is found in all the Hill ranges of Southern India and is common in the Sub-Himalayan Ranges during the winter months. As might be expected, where the country is adapted to sportsmen and shooting is more or less easy the Woodcock is said to be more common than elsewhere. Thus in the Nilgiris, about Ooty, it is quite common though it is reported to be far less so in the Assamboo Hills and to be comparatively rare in the Palnis, Shevaroys, &c. That is to say where the sportsman can get at the birds in comfort, he goes

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out and finds them common, whereas where the cover is heavy and the ground difficult he goes out far less often and sees far fewer birds.

Exactly the same conditions are found in the North-East Frontier. The Khasia Hills appear to have been forested with an especial view to provide good shooting for Woodcock and therefore tradition has long demanded that every sportsman who wishes to be known as such must pursue this bird for all he is worth. Hence it is known to be more or less common and the hardworking gunner may work up to nearly a hundred birds in a good season, indeed Major Wilson has only just missed his 200 birds in one season. Next to the Khasia Hills are the North Cachar Hills, in fact they form part of the same Range. These, however, are either very heavily forested or are covered with bamboo. The latter are seldom in India, as far as I am aware, frequented by Woodcock and the former is too heavy to allow of shooting small game with any comfort; the consequence is no one ever attempts this form of sport and the cock is said to be rare. The fact is, I think, that anywhere between 1st November and 1st March in hills over 4,000 feet elevation one should be able to find Woodcock if sufficient time and trouble is given to the search and there are suitable places for the birds to lie up in. In the plains the matter is different and here Woodcock are only rare visitors, though chance birds are met with, generally in December and January, in many parts of the country. In Burma they seem to descend to the lower countries, often almost to sea level as Oates says, more frequently than they do in India. Still, even in the latter country, wherever there are hills near by cock are sure to be found at more or less frequent intervals during the cold weather.

In Dibrugarh, in Lakhimpur, which is surrounded by lofty hills at no great distance, anything from five or six to a dozen are shot annually. In Cachar one or two are seen or shot each cold weather and the same in practically every district of the Assam Valley. In Dibrugarh there are a few places which are almost a certain find for an odd cock or two during December and January and Mr. F. Moore, who made a point of looking up these birds, always succeeded in getting from four to a dozen birds each year he was in this district. In Sylhet Cripps reported it to be so common that he had known of as many as four brace being obtained in a single morning.

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Once, however, we get any distance from Hills cock only appear as rare stragglers and in these cases it is probable that birds migrating from one range to another are, as the Irishman said of the owl, benighted by day and have to stop where they are until the succeeding sunset. In this way woodcock have been shot in Guddam (Golconda), Kurrachee, Sitapur, Agra, Nynpuri, Cawnpore, Dacca, Rangoon, Tavoy, Calcutta, Madras, Kanara (away from the hills) Taipuo, Bombay and many other places.

For some reason the woodcock always forms a most fascinating object of pursuit for the sportsman. It does not matter whether it is a cold, hazy morning in the Welsh coast, a sweltering day in the foot hills of the Himalayas, or a balmy day in the lovely climate of December in the Nilgiris or Khasia Hills; the owl-like flip-flap of the brown bird's wings brings the same little thrill to the gunner and the soft thud amongst the bracken and bushes in reply to a successful shot brings a feeling of pleasure that is, for some reason, paralleled by the slaughter of no other game bird.

The haunts of the woodcock are in themselves attractive and one can wander, gun in hand through sombre pine forest, sunlit copse of oak or the dense scrub of an Indian ravine always with a certainty of being interested, whatever the sport may be. There is something in one's surroundings which makes one take an optimistic view of life and it is not until one returns to buildings and the cook has worked his will on the results of the day's bag that one once more remembers that "only man is vile."

My experience of cock shooting in India, is, unfortunately, practically nil. I have shot a casual cock in the plains of Cachar and of Kamrup and more than occasionally have bagged a brace in North Cachar but I have never had the delight of a long day's trudge through the bracken and pine forests of the Khasia Hills, in which I have now lived so many years. Perhaps the most successful of the many sportsman Shillong has harboured is Major Wilson of the 8th Gurkhas and to him my thanks are due for much information and a most interesting account of his first cock in 1908. He writes "They generally arrive after the 15th of October, (though I see in 1890, I killed one on the 8th) and I generally begin to look for them about that date, this year without result till the 23rd. On that day, I happened to have for my morning parade "Exercise in hill climbing,"

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so took my men up the side of the big hill overhanging Shillong, which is pretty well covered with pine forest.

"On parades like this, during the shooting season I consider it legitimate to carry a gun, and to take my two spaniels "Celar" and "Audax" with me.

"We, that is, my following of about 100 men, my batman with the cartridge bag, the two dogs and myself, start up the hill within half a mile of my house. A road runs zig-zag up the hill through forest and a hundred yards or so to the right of the road flows the stream which forms part of the station water supply. We pound steadily up the hill until we have already marched about a mile and a half, up some 1,100 feet. Here I think the men may as well halt to get their wind, whilst I go down to look at the stream.

"Celar" and "Audax" go into the wood above me, and presently one of them gives tongue. I see nothing, but from some little distance up the hill I hear the wings of a bird clicking against the branches of the trees as he flies, a sound I have noticed with both woodcock and pheasant at home. A second later, he gives me the type of shot I love best, coming towards me high overhead. I throw up the gun, fire, and as I lower it, see the cock crashing down through the branches. The orderly picks him up, and not having seen me shoot one for at least seven months, asks what he is to do with it, thereby showing to how great an extent, the present system of training the individual soldier to think for himself acts on some individuals. Not having sufficient command of his vernacular to tell him to put it "where the monkey put the nuts," I tell him to bring it along.

"On returning to my small command, who have by this had a good five minutes' rest, the bird is duly admired, and we fall in and plod still further up the hill. On reaching the top we turn to the left along the edge of the Government reserved forest, passing some likely looking ground, but as I should have to halt my men to try it, it is scarcely the game to do so now, so I call off the dogs, who are only too keen to work it. Along the crest of the hill for a mile or so, and then we begin to descend. Half way down, a stream runs almost parallel to, and about fifty yards from our path, and as I can keep in sight of the men, I think it quite legitimate to work it.

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"Just at this moment, the dogs rout out a brace of Rufous-necked Partridges from amongst the bracken beside the path, and both are added to the bag.

"The bed of the stream looks, and usually is, a grand place for a Woodcock. Here and there are swampy bits, or patches of bracken, while both banks are covered with fern and daphne, with a fairly thick pine forest over all.

"The dogs hunt this valley for about six hundred yards down to the bottom, but there is no sign of anything till I am just coming out of the wood, when I hear a flutter to my right, and the orderly shouts he has put up a bird.

"I push my way through the grass, cobwebs and bushes, and ask if he has marked it down.

"He says he has, so we walk it up, I see a small brown shape flitting through the undergrowth, and the second cock of to-day is added to the bag; we then come out and rejoin the sepoys on the road and march home, the result of the morning's work being a march of seven miles up and down about 1,100 ft. over fairly rough country, with a brace of partridges and two woodcock to show at the end of it, all done within two and a half hours."

It will be seen from what Major Wilson writes that we do not in India get birds in the numbers they are obtained at home. In Shillong and its vicinity four or five birds in a day's tramp must be considered fair sport and six to eight birds something quite out of the common. Major Wilson has shot eight to his own gun in a day and Mr. Faichnie, of the Postal Service, once got nine but I have heard of no bigger bag to one gun in a single day's shooting. In the Nilgiris, Hume says "ten or twelve birds to two guns in a morning is quite an unusually fine bag so it must not be supposed that they lie thick as a rule, and yet in particular parts of the hills five or six are sometime shot out of one tiny shola, not perhaps above thirty yards wide and not a quarter of a mile in length." The largest bag recorded for India is that recorded by A. Grahame Young in Hume and Marshall's *Game Birds of India* 28 years ago. This bag was made in the Tos Forests in Kullu. Hume quoting him, thus records the bag. "The end of January is about the best time for them. The largest bag that I know of was 33 birds to two guns between Nuggur and Ryson; a good many others were missed. If the season be at

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all favourable, one is pretty sure of flushing a dozen or so in the course of a day in the favourite haunts."

Hume writing of these favourite haunts thus describes them: "Cover and running water are what in India the woodcock most affects; you may find them alike in the middle of deep forest or thick Ringal jungle near the banks of some rushing hill streamlet, foaming and sparkling in its rushy bed, where save a few tiny velvety corners, there seems no single spot in the neighbourhood where they can possibly feed; and again in clumps of low scrub in a treeless opening where some stream debouching in a clayey basin converts this into a mossy swamp, through which its movement is to be detected only at the further end where, as if ashamed of its late sluggishness, it gushes out to resume its late brawling descent. But, swamp or stream, the water must be moving to please the Woodcock; and though there are exceptions to this rule, you will generally hunt in vain mountain swamps and tarns, where there is no outlet and the water is stagnant, though all the surroundings and adjuncts be everything, apparently, the breast of woodcock can desire. In England we find them beside little stagnant ditches and pools in covers; but in India I have seldom so seen them, having almost always flushed them in the neighbourhood of running water."

In the Khasia Hills they undoubtedly generally affect places within easy reach of running water, but this is possibly because in these hills it is difficult to get away from it. They certainly sometimes lie up in small patches of swamp which are not directly connected with any running water for some distance. Thus, until this year when the whole patch was cleared, a woodcock could always be put up in a tiny patch of swamp not 50 yards by 20 which is at the bottom of my garden. I never allowed a gun to be fired here and the birds soon became curiously tame never rising until one was within a very few yards of where they squatted. Major Wilson has recorded a similar instance in his own compound. "Speaking of the little place in my garden it is a bit of rushy swamp, about twenty yards long and ten wide. On one side of it is open grass, and on the other a bank on which grow some brackens, bushes, and about a dozen pine trees. Early one morning, I let the dog into it, and a woodcock jumped up almost at once, flew over the dog, and pitched on the grass about five yards from me, where he squatted about five yards

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off with his tail spread like a turkey-cock's, awaiting developments. The dog worked up to the end of the marshy bit and knowing there was a bird there, turned and came back towards me.

"When the cock thought he was too close to be pleasant, he again executed his manœuvre of flying over the dog, and I distinctly saw him use his beak to lever himself, as it were, into the air. This time he pitched where I could not see him, and when he rose again he evidently meant going, so I let fly and very nearly bagged an old native woman in the next compound as well."

In connection with this little piece of swamp the same writer has commented on the regularity with which woodcock return year after year to the same piece of ground. "I soon discovered that to find woodcock with any certainty a good spaniel was required, as well as an intimate knowledge of the ground, for one woodcock succeeds another in a favourite spot, just as one trout succeeds another behind a big stone in a burn at home, and in Shillong the places the cock mostly frequent are few and far between.

"This peculiarity of the bird I learnt before ever I came out to this country, and it was well expressed a few days before I left home by an old retainer of ours, who said; 'Now, Mr. A., I may be deid and gone afore ye come back, but ye'll mind the holly bush on the bræ abuve the kirk-yard. When the snaw's on the ground, it aye hauds a woodcock, and a graand ane.'"

Many a woodcock I shot there as a boy, and no doubt many a one has been shot there since. So it is in Shillong. Each year the cock arrive, their instinct brings them into the haunts their ancestors frequented, though, alas, these haunts are getting fewer and fewer as the station extends.

"The unwillingness of the 'cock to leave a favourite spot, so long as any cover at all remains, is shewn by the fact that both last season and the season before, I got an occasional bird within thirty yards of my house, fifteen from a much-used foot-path, and about fifty from some stables. This was a cosy little bit of covert in the old days, before the ground was so much built over.

"There is a drain and slightly marshy bit of ground in the midst of our Regimental lines where the 'cock feed at night still, although the barracks have been inhabited for close on forty years."

In England, of course, cock shooting is indulged in under very different circumstances and with very different results and I was

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fortunate enough on one occasion in Wales to participate in a shoot in which three guns got 49 couple of cock in a very few hours. We had been shooting three days a week over the rough country all round the South Coast obtaining small, mixed bags of pheasant, partridge, hare, &c., anything from ten to thirty brace a day but never, as far as I remember, had a cock shown itself. On the day in question, a crisp November morning in 1894, we start our morning trudge with a beat through some bracken bordered by a tiny copse of oak and scrub on the crest and with a ditch and some swampy ground at the foot of the hill. As we enter the bracken a hare breaks and is neatly turned over in the open by H, the gun on my left hand. The report, however, puts up a small covey of partridge, out of shot, who sweep over the little copse and pitch in a field just over the covert. Finishing the bracken without further result we turn round and beat the far side of the hill for the partridge. I, as right-hand man, taking the deep bracken lying just inside the oak trees. We have only gone some hundred yards when we walk into the birds, which have scattered a little, and four are added to our bag. I have one shot and a miss at the partridge but as I fire I catch a glimpse of what I am sure is a woodcock get up and flit through the trees to my right, but on saying so I am merely laughed at for my pains, as the cock are not supposed to be in. I, however, insist on beating back through the spinney on my own account and hardly have I got well inside when two cock are up and off before I am ready for them. Within five paces, however, another gets up and falls to my shot and as he falls another rises and is missed. Before I can load the spaniels have another bird in the air and before I have walked the spinney through five birds have been dropped and at least as many more missed. After this the other guns come up and after inspecting my bag it is at once decided that a large flight must have just come in and that the original day's shoot should be abandoned for the purpose of hunting up the most likely places for the cock.

Their favourite haunts along these Coasts are the numerous small copses and spinneys which nestle in between the hills, sometimes running a little way up the sides, often surrounded with a fringe of light scrub or gorse and nearly always with a tiny stream trickling down the centre and losing itself in a swamp at the foot. We soon

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come to one of these little woods and arrange to work it from the bottom upwards, one gun taking the centre and the other two the edges. As the guest I am given the best place in the centre but before we get into the wood itself two cock are put up from the bracken at the edge of the swamp and are downed with a pretty right and left by my host. No more birds are seen until we are well inside the cover when a single bird gets up from the mossy bed of the tiny stream just in front of me and is promptly bowled over. A second gets up within a few yards but I miss badly and the bird jinks away to my right and I hear the bang, bang of H., gun number three, a good shot who has doubtless accounted for him.

For some time I get no more shots only putting up one bird which flops out of my sight before I have time to take a snapshot at him. The birds seem to be lying up in the holly bushes and gorse on the edge of the copse and both my neighbours are getting repeated shots and soon one of them missing a double shot, turns a cock my way and he comes towards me in and out of the trees with his curious owl-like flight and though he escapes my first barrel the second brings him down almost on my head. I then get a pheasant and miss another cock but finish up the beat with a nice right and left at a pair of wood-pigeon.

Counting our bag we find that B, our host, has six cock, a pheasant and a rabbit, H. two pheasant and four cock and myself a pheasant, two pigeon and two cock.

Our next beat is a narrow strip composed of scrub and holly bushes intermixed with a few bigger trees fringing a ditch of running water which here and there widens out into small patches of bracken covered swamp. This is too narrow for three guns, so B. goes ahead and stands at the end, whilst we beat up to him. A start is made by H. with a right and left at pheasant and we then walk half way through before we get another shot and we begin to think the birds are not so thick after all. Here however from a dense patch of holly bushes the dogs put up four cock together and we have the pleasure of accounting for all four though, to level matters, we each miss a comparatively easy shot immediately after. Yet again we have four birds in the air at the same time but we only drop three, two are picked up at once and whilst hunting round for the third another bird gets up between H. and myself and flies straight towards me; neither can shoot until he

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gets almost up to me when he rises and tries to dodge back but is bowled over with a lucky shot just in time.

So on through the strip with constant shots all through its length and, curiously enough, in this bit of cover we keep putting up the birds three and four almost together with intervals in which we put up none at all. The taller trees are scanty and the bracken very withered so the cock are all hiding under the many clumps of holly bushes and brambles at the very edge of the swampy pieces. The shooting is easy in the comparative absence of the taller trees and we find when we get through our beat that H. has nine birds to my ten and that our host has beaten us both with 12 cock and a pheasant.

We do not have such luck, however, with our next beat which is a pine wood with very little under-growth and no water. Here we put up three or four cock only and get but one, though we add a couple of rabbits and one more pheasant to the general stock. Leaving this wood we work through a scarp facing the sea and covered with bracken, gorse and brambles whilst every few yards a cheerful little cascade goes tumbling down into the sea below us. Both rabbits and cock are very numerous here, but the walking is terrible and, having but one arm both to shoot and climb with, I frighten a great many more birds and rabbits than I kill, indeed I emerge the other end of the scarp with but one cock and two rabbits, a result exactly doubled both by H. and B., the latter adding a brace of partridge out of a covey put up on the fields above him by some labourers.

Yet another scarp succeeds this one, but the walking is better and out of the 7 birds collected here I claim three having only missed one. This beat brings us up to the farm where we have lunch, a Welsh lunch of cold birds, apple tart and Devonshire cream washed down with draught beer. Half an hour more for a smoke and our host makes us turn out again to take full advantage of a day's shooting of a kind that does not come too often.

Walking down the lane a small boy says he has seen a cock pitch in some brambles by a pond in the field to our right and, sure enough, the dogs turn him out and B. adds him to the fast-swelling bag. From here we make for three small spinnies divided from one another by about a hundred yards or so and themselves covering only two or three acres each. Our host and B. each take one corner and send me on ahead to shoot the gaps and very pretty shooting I get. They have

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hardly got into the first spinney before a couple of shots are heard and a few seconds after a cock comes flitting towards me out of the last few trees and as he passes I bowl him over; a little fluff of feathers rise into the air, a soft thud on the grass and before we can pick him up a second bird is dropped almost on the top of the first and no sooner are my cartridges home than a third follows. Then I have two long shots and misses and whilst reloading another passes over me before I can shoot. Both B. and H. are in sight now and I prepare to move on to the next gap but as I turn round a cock flies almost into me and, giving him a little law, he too finds his way to grass.

The second gap is a repetition of the first but here I put in six misses to three kills as the birds do not fly so kindly for me. The last spinney is best of all, the birds seem determined to favour me and I get two shots to every one by the two guns inside and when they come out I am able to shew them 13 birds, of which 6 have been the result of the last spinney, besides a wood-pigeon and a pheasant. The others between them have 15 cock, two rabbits and a brace of pheasants so we have every reason to be jubilant. We have now 88 cock, a bag never beaten here before but we are not yet finished. Another long pine wood with bracken and hazel on the outskirts only gives us a single bird but a hazel copse a few yards further on gives us three more and but for my bad shooting should have given us five. Then we pick up two odd birds, one from a holly hedge near a pool and another from a bracken patch bordering some turnips. By this time it is getting late and the birds are now in the open feeding and H. gets one as it flaps overhead, making its way from one feeding ground to another. Only a few minutes more of day-light remain and we hurry for the last beat on our way home. Here we find that there are still lots of birds but it is getting too dark for good shooting and we miss more than we hit so that only three more birds are brought to book. We have now 98 birds and our host insists on our trying to make up the hundred, but three or four more misses in the gloaming at silent things, more like bats than birds, and one bird lost in the dark are the only results, so we have to be content with making the biggest bag of cock recorded in my host's shooting experience. A tramp of two miles to the carts in the fast gathering dark and then home after a long twenty miles trudge and the best days small game shooting I ever hope to have.

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Contrasting well with Major Wilson's account of shooting in the Khasi Hills and with ordinary cock shooting at home is the account given by Tickell of cock shooting in Nepal which is quoted by Hume. "Woodcock-shooting in Nepal is laborious work from the steepness of the hills and the spongy nature of the ground which the bird frequents. We found them on light rich mould, thickly matted with grasses, ferns, and other weeds, and everywhere furrowed by little rills of water trickling through the tangle, or here and there stagnating in little pools or 'bog-holes' concealed under a layer of vegetation, which formed tolerable pitfalls to the unwary intruder, receiving him sometimes up to the hip. The jungle on these hills is pretty thick, but not lofty, consisting mostly of briars and thicket; and it would have been impossible to get a fair shot within it, were it not that some of the largest rills (perhaps a yard broad) bordered with mossy turf, formed narrow vistas through the tangle, up and down which the birds when flushed would fly, giving some chance to a snap shot. We had no dogs, a luxury known to very few Indian sportsman, but employed beaters to find the game. I had never even seen cock-shooting in England, and my first day's experience of it in Nepal surprised me not a little. I was a good snipe shot in those days, and, imagining from the general resemblance of the two birds that a Woodcock must fly like a Snipe, I was much taken aback, when hailed to 'look out,' at perceiving what appeared like a large bat coming with a wavering, flagging flight along the little lane-like opening in the wood where I was posted; but in an instant, ere I had made up my mind to fire, the apparition made a dart to one side, topped the bordering thicket, and seemed to fall like a stone into the covert beyond. These sudden jerks and zigzags, in the midst of its otherwise dilatory flight, are terribly puzzling to a novice. The bird alights also in the same fashion, dropping at once down as if it had flown against a wall. They were not numerous in Nepal, and two couple bagged to one gun during the afternoon was considered very fair sport. We found them only on the low spurs bordering the open valley of Kathmandu, on its northern side—on such slopes as were of the description above given, looking more like the copses and hazel woods of England than the forests of India."

Tickell's remarks on the birds flight are very good and to the point. At home the bird is a strong, good flier and the curious inde-

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finite manner it has of flying is often far more puzzling to a beginner than the flights of swifter straighter-going birds. Its very haunts, of course, add to the difficulties of shooting as in addition to its naturally zigzag flight it is constantly twisting and dodging to escape obstructions, then too the light is often not of the best and the extreme silence of its rise and flight is in itself disconcerting. There is no warning whirr of wings or "pench" as of a snipe rising, the first thing is you see it, perhaps only as it flits behind some impossible jungle, barely giving time for a hasty snap shot.

In India the Woodcock seems to be of a far more tame and confiding nature than it is in Europe and this also affects the flight as the bird makes no effort to get away at any pace when it is flushed. Hume writes :—"When migrating they are said to fly strongly and well, but when flushed, the flight is at first slow, uncertain and Owl-like, and ceases suddenly, the bird dropping instantaneously behind some bush. I have never had any sport with Woodcock in Northern India. I have often shot them, rarely more than three in a day ; but they gave no sort of sport. They fluttered up flushed by the dogs or some beater within twenty yards, and were knocked over by a snap shot as they hung wavering on first rising. One shot them because they were so good to eat ; in every other respect they were not worth shooting. They don't seem to fly a bit as Woodcock do in covers at home, where even a good shot is at times baulked ; but, like Snipe, and almost every living thing domiciled in this "clime of the sun," they seem to have become listless and sluggish."

The manner in which Woodcock are said to perform surgical operations on their own wounds has often been alluded and is a common belief with gamekeepers and others, indeed many sportsmen whom I have met are quite convinced that the apparent attention which has been paid to a wound is the intelligent work of the bird itself. Thus Major Wilson writes me :—"On two occasions I have noticed instances of the so-called wonderful way the Woodcock has of doctoring itself. One day I wounded a bird, saw it go off badly hit but failed to pick it up. A fortnight or so later I flushed a bird in exactly the same place and got it. It seemed in very poor condition and on examining it, I found it had what looked like a regular splint on one of its legs formed of a tiny piece of stick most carefully bound round with feathers. The other case was one of a

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bird which had evidently escaped from a snare. A great patch of skin had been torn off just above the wing and this was covered with a poultice of feathers beautifully attached to the feathers growing in the bird's body."

Of course, these works of art are the result of accident, not design, and are caused by the birds lying in muddy places. The wounded part, in most places wet with blood already, naturally gets covered with mud or clay to which feathers, tiny sticks and grass adhere and make, what Major Wilson terms, a poultice and doubtless this may be in some instances as effectual as a splint or poultice made by design. I once shot an owl with a badly smashed thigh, how caused I do not know, but it had been lying in muddy grass-land and the breast, next the wounded leg and the whole thigh itself had become densely matted with feathers, chips of grass, mud and blood which formed a perfect plaster of Paris splint and in addition to this, in lying down the bird had had the wounded leg forced up against the breast where the foot had stuck to the feathers and mud so that it might have been said that not only had the bird arranged a splint for itself but had also put its foot into a sling to prevent its moving about.

The Woodcock is generally considered rather a stupid bird and an easy prey to trappers and snarers who take full advantage of his weak intellect.

They are said to be regular trapped in the Nilghiris and parts of the Himalayas and certainly in the Khasia Hills snares are to be found set in almost every place known to be haunted by Woodcock.

In Latham's Synopsis, Vol. III, p. 130, there is a very quaint description of the Woodcock. Amongst other things Latham notes that "they are stupid birds and often taken in nets placed at the openings where they come out of the woods and return to them in the evenings, which they do in particular paths; they are also caught in springes placed on the ground, or near it, sometimes by the legs, at other times by the neck; for as these birds will not walk over the least obstacle which projects in their way, it is usual to place a range of stones and in the avenues between to set springes, by which means many are often taken."

The Woodcock is a very silent bird and but little is on record about its voice. The male is said to have a hoarse, grating note

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called "a bleat," "a croak," "a jarring chuckle" by various writers. Mr. Osmaston speaks of the noise made by a female Woodcock disturbed in its brooding as being "a continuous sort of grating purring noise." Hume says that as far as his own experience goes the Woodcock is mute in the cold weather, but he quotes Mr. Wilson as writing of them in their summer haunts: "At this season they are seen towards dusk, about the open glades and borders of the forests on the higher ridges, flying rather high in the air in various directions and uttering a loud wailing cry." Hume also quotes "European authors" to the effect that the Woodcock has "a very peculiar call-note, first one or two snorts, a hollow coarse, somewhat lengthened nasal sound, followed by a short fine sharp sort of whistle, which when one is accustomed to it, may be heard to a considerable distance."

The diet of the Woodcock ranges over rather a wide limit. Tickell says it will swallow a lob worm whole, I have found tiny snails and water shells in its stomach and on another occasion a bird I examined had been feeding entirely on some small white worms, of a very wiry hard consistency. It feeds on grubs, beetles, insects of almost any sort and will also swallow spawn of frogs. It is almost entirely a nocturnal bird, even more nocturnal than crepuscular, feeding after dark or only a very short time before nightfall. In the day it lies up and sleeps, and at this time is usually found in a dry spot though near water.

Breeding Habits and Nidification.—There are two points in connection with the breeding of the Woodcock which call for remark: first is the curious manner of flight during the breeding season, somewhat analogous to the drumming of snipes; and, secondly, the habit the Woodcock has of carrying its young from one place to another.

As regards the rôding of the Woodcock, as its habit of flight during the breeding season is called, this is described by Seebohm as follows:—"The Woodcock does not drum like the snipe but during the breeding season like that bird, the male forgets for a time his skulking habits and flies backwards and forwards, uttering a peculiar note, which, though unquestionably proceeding from the throat, must be regarded as analogous to the drumming of the snipe. This peculiar habit of the Woodcock is described as rôding and is

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indulged in early in the morning and late in the evening, in the pairing season, sometimes before it reaches its breeding grounds, but more often after its arrival there. This rôding continues for about a quarter of an hour, during which his peculiar notes are uttered, sometimes singly and sometimes one following the other."

Dresser quoting Ekström gives in greater detail the manner in which the Woodcock rôdes. He writes :—" During the first days of spring the Woodcock commences rôding the instant the sun has sunk below the horizon, but at a more advanced period somewhat before its final disappearance and continues until nightfall. In the morning it begins rôding whilst it is still quite dark, and ceases previous to its being full daylight. When he rôdes there is always an interval between each *tour* and *retour*, which is more observable in the evening, when it goes and returns there several times. The first time it always flies high and generally with rapidity, the second its flight is but little above the tree tops, and commonly slower, the third time still nearer the ground and yet more leisurely." Oates who quotes both these authors adds " when flying about in this extraordinary manner the plumage is puffed out and the flight is rather slow."

Oates' remarks agree well with what was told me by a gamekeeper in Wales, who said that he had observed Woodcock just before they left in March rôding outside some of the spinnies I have mentioned in my account of a day's shooting in Wales. This man informed me that just at dusk the cock came out of the cover and sailed slowly backwards and forwards a few times in front of it. At first the flights were high, but gradually the birds got lower and lower until reaching the level of the scrub they again disappeared into it. Each flight was said to be in the shape of a long arc, the highest points being reached at the end and commencement of it, whilst in length they were anything from 50 yards to 200 or more. The bird was described as flying slowly with plumage puffed out, head thrown far back and bill somewhat pointed upwards. I did not inquire how many times the flights were repeated, but the impression I obtained was that they were numerous and lasted for some time.

In this country Mr. F. Wilson, whose note I have already quoted, seems to be the only writer who has recorded anything in regard to

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these nuptial flights. Mr. J. Lindsay Smith has, however, written me an interesting letter on the Woodcock and its habits on Dungagali, and he says in this that he has often observed them rôding; and that whilst thus engaged this bird utters "a rather harsh croak alternately with a sharp whistle or squeak, something like that of a cat but very much stronger."

The habit the Woodcock has of carrying its young from one place to another is very well known, but there are not many descriptions on record of how the carrying is done.

Davidson saw the bird in the act of carrying its young in Kashmir, but has unfortunately left but little on record about it. He observes:—"On the 28th May I found a pair with small young ones and distinctly saw one of the old birds carrying a young one between its feet or legs. It flew only some 50 yards, but though I followed at once, I not only failed to find the young bird, but could not even put up the old one again, and on returning could not find the young one that I had previously noticed on the ground."

Littledale also records having seen the same occurrence. He writes, "to my delight up flew a Woodcock about five yards from my feet. She had a young one—the men said two young ones, but I could not see two distinctly myself—in her claws pressed close under her; and she flew slowly and heavily for about ten yards, then rested above a bramble which the young one seemed to catch hold of with its claws, or become entangled in. The old bird fluttered for quite half a minute over it, before she could pull the little one clear and fly a few yards further down, when she alighted but rose again, when I sent a man to try to catch the young one."

A friend in Scotland to whom I wrote to obtain information on this point informs me that he has only once *certainly* seen the Woodcock carry its young, though he believes that on two or three occasions when he has disturbed cock in spring they carried away a young one with them. On the occasion he refers to as having distinctly seen what happened he writes *in epistola*:—"We came on this bird very suddenly and she rose almost at my feet and made off with a young one held tightly up against her breast, and, I think, held on either side by her claws. As she left three young ones behind her when she first flew away, I at once hid myself and awaited to see what further she would do. In a few minutes back came the old

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lady and dropped on *the* ground close to the nest and after scuffling about a bit she grasped one of the young ones on either side and picked it up. As she rose I could see that her extended legs held the young one low down on either side, but she at once drew up her legs close to her body and then appeared to be holding it between her breast and thighs, this of course owing to the contracted position of her legs. Once started she flew quite easily to some distance, but seemed to find it rather difficult to get a comfortable hold of the young ones at first. She removed all four a distance of nearly 50 yards within about a quarter of an hour."

It is not definitely known whether both parents share in the labour of removal, but it is probable that such is the case. Indeed, from Davidson's note given above, it would appear rather as if whilst he was following one of the parent birds, the other had carried off the remaining youngster.

It is possible that the removals are not always due to the birds being disturbed, and it may be that they are undertaken also for the purpose of getting to fresh feeding grounds. On several occasions young Woodcocks known to be in one place have been found removed to some distance, although, as far as was known, no disturbing element had approached the original nest site.

The Woodcock breeds very freely throughout the Himalayas at 10,000 feet upwards and probably also very much lower down. Whether its breeding range extends to the East as far as the more lofty ranges of the Naga Hills and Manipur is very doubtful, and there is nothing to show that it breeds in any of the Burmese Hill Ranges.

Although so many Oologists have taken its eggs in this country, there is curiously little on record about its nidifications therein. Hume when he wrote the "Game Birds" remarked on this, and noted that of the many who had taken the nests, the only account he possessed was that given him by Anderson, which he quotes as follows:—

"On the 30th June, I turned my face towards the snows in another direction, determined to consider my expedition a failure so long as the discovery of the breeding haunts of the Woodcock, which was one of its chief objects, still remained unachieved. After two days' stiff marching I pitched camp at a place called Kemo, at

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an elevation of some 10,000 feet over and against Namick, which is celebrated for its salt springs."

"We were following up a huge wounded *Presbytis schistaceus* through a dense undergrowth of ringals, when a Woodcock rose close to us, dropping again almost immediately, disappearing in the cover. A diligent search revealed the long-looked-for prize, four eggs, which were deposited in a slight depression in the damp soil, and embedded amongst a lot of wet leaves, the *thin ends* pointing *inwards* and *downwards* into the grounds."

"The eggs found (I could see they were hard-set), I told Triphook I had no intention of leaving the place without bagging the bird. It was raining heavily and bitterly cold with the thermometer down to 40°; but fortunately for us, before we had time to make ourselves comfortable under an adjoining tree, the bird flew back in a sort of semicircle, alighted, and ran on to her nest. No sooner down than she was off again, frightened, as I subsequently learnt, by one of our dogs, but which at first thought alarmed me not a little as I thought she was removing her eggs. After having satisfied myself that my suspicions were unfounded, it was decided, as I had done my duty in finding the nest, shooting the bird should devolve on Triphook, and right well he did it, considering all the disadvantages which militate against having a snap-shot in dense cover and a thick mist. I never do anything but miss on such critical occasions; at any rate, I would rather some one else made a *mull* of it than myself."

"The eggs were a most beautiful set . . . they are far *darker* and *redder* than the usual run of Woodcocks' eggs, all four resembling the *second* figure in Hewetson's work, and in the character of their markings they are not *unlike richly* coloured specimens of some Terns' eggs."

Osmaston has an interesting account of the finding of a nest in the Tons Valley, especially interesting as in the case there was no attempt to carry off the young; the mother, when disturbed, attempting to divert attention by feigning being crippled. He says that after finding the mother and tiny young, only a day or two old, the former "all the time I had been inspecting her brood had been going through the strangest of antics with outspread wings and tail, and making a continual sort of grating, purring noise. She allowed me

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to approach within a few feet, and then, with an apparent effort half fluttered, half ran away."

Rattray took a large number of nests of the Woodcock in Changla Gali, Danga Gali and other places near Murree. In our Journal (in *loc. sit.*) he records:—"This bird breeds freely round Changla Gali from about 8,500 feet upwards. I saw some 8 or 10 pairs, and found some 5 nests, each containing the usual four eggs. The nests were all in thick forests and generally under a shrub like Rue. The nest is a typical one. I hope next year to get a good photo of a sitting bird and settle the question I lately ventilated in "The Field" as to birds sitting with eyes closed and bill resting on the ground."

The typical nest referred to is that shown by Rattray in the beautiful photograph which accompanies his article. This shows a nest formed by a depression in a mass of leaves and rubbish lying on the ground under a thickly foliaged bush.

In India the Woodcock seems seldom to breed before May and generally not before the end of that month. Osmaston found young birds on the 17th June in the Tons Valley. Davidson says:—"On the 24th and 25th May we obtained two clutches of its eggs, consisting of four slightly incubated and three fresh eggs, and on the 28th May I found a pair with small young ones." This was in Kashmir near Ganjadgir, and I have eggs in my own collection taken by Rattray at Danga Gali as late as the 14th July. Lindsay Smith records hard set eggs as late as the end of August, and he twice came on nests and eggs, broken by cattle, at the end of July.

In Europe they seem to breed a great deal earlier than in India. Many seem to commence breeding operations in March, and I have European eggs taken in March, April and May, my latest date being that of a clutch taken in Germany on the 25th May. They are, however, sometimes much later than this. Davidson writing to me on the 6th August says that as he is writing there is a Woodcock sitting on four eggs in his own preserves, and he adds that this is the third sitting, the bird having hatched off two previously.

Hewetson says that the "Woodcock lays its eggs amongst the dry grass or dead leaves which form the surface of the woods and plantations which it frequents. It is an early breeder, frequently having young ones in the middle of April."

Yarrell describes the nest as being "all in dry warm situations

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amongst dead grass and leaves without any attempt at concealment. The nest was wholly composed of dead leaves, chiefly of the common fern, loosely laid together and without any lining."

"It would, however, be more proper to say beds than nests: for, like those of the Plover, they are merely slight hollows, formed by the nestling of the birds in dry soft spots or on the fallen leaves."

Seebohm (Eggs of British Birds) merely says that the nest is placed on the ground and is little more than a hollow scratched in the earth and lined with a few leaves and a little dry grass.

The eggs appear to be *always* four in number, and I have no information as to any full clutch numbering less. Typically the eggs are far more tern like in character than like snipes' eggs as one would have expected. As a rule they are broad ovals, distinctly pointed at one end and sometimes *slightly* "peg top" in shape, but *never* the actual peg top of the true snipes' eggs. The texture of the eggs is fine and smooth and often has a considerable gloss, which is more or less permanent, as I have eggs in my collection more than 20 years old which still show a fine glossy surface.

Hume thus describes his eggs:—"The ground colour varies from pale yellowish white, through various shades of buff and buffy stone colour to a reddish café-au-lait. The markings never very densely set and at times very sparse, consist of different shades of brown, brownish-yellow and brownish-red on the one hand, and greys, from sepia to purple on the other. The former occur in moderate sized blotches, spots and specks as primary markings. Often these are more numerous in a cap or zone about the large end. Occasionally not a single blotch or spot is one-tenth of an inch in diameter, and nine out of ten are little more than specks, but in other eggs many of the blotches, especially about the large end, are a quarter of an inch and upwards in length. The greys, pinkish, lavender, sepia occur as small clouds, spots and smears, secondary not surface looking markings rarely either large or thickly set, except when amongst the blotches of a zone or cap, when the eggs exhibit such."

"A large series, chiefly Northern European, vary from 1·5 to 1·8 in length and from 1·3 to 1·5 in breadth. I have no Himalayan eggs, but I suspect that like the birds they would average smaller than European specimens."

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My eggs which contain series from Scotland, England, Germany and India agree well with Hume's description except one clutch from Germany which has a red café-au-lait ground with dense blotches and smears of rich vandyke brown and a few subsidiary blotches and smears of deep-lavender.

My Indian eggs average 1·6″ × 1·32″ as against an average of 1·70″ × 1·34″ in English and Scotch eggs, and 1·69″ × 1·32″ for German eggs. My biggest egg is one from Germany, measuring 1·86″ × 1·54″, my smallest is from Scotland and measures 1·59″ × 1·26″.

It will be seen that the measurements of my eggs do not bear out Hume's opinions as to Indian birds being smaller than European, but rather endorses my view that Indian birds average small, because they are immature.

Seebohm gives the size of the Woodcock's eggs as being 1·8″ to 1·6″ in length and 1·4″ to 1·3″ in breadth.

Dresser gives the average size as being 1·75″ × 1·32″.

THE PLATE.—This is an excellent one. This bird in the background is supposed to represent the grey phase of colouration, but, though this is well shown in regard to the scapulars and back, yet many birds will be found far more grey than this specimen on the lower parts and wing quills also. As regards the bird in the foreground all that need be said is that the white round the eye is far too conspicuous and the bill is not a normal colour. It is true that in a few birds the tint of the bill may be as depicted, but, as a rule, there is always a more flesh or horn-coloured tinge about it.

It must be remembered that the range of variation in the depth of colouration of the Woodcock is very great, and though the plate is a very fine example of one shade, many birds will be found to be paler, especially on the lower parts, whilst some again may be obtained even darker than this bird.

In life the eye of the Woodcock seems even larger, darker and more lustrous than it is shown to be in the plate.

(*To be continued.*)

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THE PALMS OF BRITISH INDIA AND CEYLON, INDIGENOUS AND INTRODUCED.

BY

E. BLATTER, S. J.

(With Plate I and Map A).

INTRODUCTION.

It was a favourite idea of the late Dr. Scheffer, formerly Director of the Botanic Gardens of Buitenzorg, to illustrate by means of photography the palms of the Malay Archipelago and many others from various parts of the world which grow so luxuriously in the famous Gardens of Java. His premature death (1880), however, prevented him from giving life to his idea and from finishing the promising series of illustrations which he had started in the "Annales du Jardin Botanique de Buitenzorg." Professor Beccari was kind enough to undertake the publication of some of Dr. Scheffer's notes and plates, enriched by his own valuable observations. It is to be regretted that, after the appearance of the "Reliquiæ Schefferianæ," nobody felt inclined to continue the work, as there is scarcely a better way of conveying correct notions regarding the habit of palms than by means of photographic illustrations. Even the most elaborate description and detailed analysis will never, in that respect, come up to a tolerably good photograph. It is for this reason that we intend to publish a series of articles on Indian palms, indigenous as well as introduced, and to illustrate them by as many photographs as we are able to procure. We are sorry not to be in a position to give much fresh information with regard to the morphological characters of most palms, as the leisure required for such observations was not at our disposal. We have, however, tried to make the descriptions as complete as possible by carefully comparing and, where practicable, verifying the descriptions and illustrations as given by various authors. In many cases, where we found a good description of a species we have not hesitated to adopt it almost word for word, supposing that everybody will understand that in a condensed, technical description of a plant not much originality can be expected, especially if a uniform plan has once been adopted. In this we are only following in the footsteps of systematic botanists.

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With regard to the classification of the palms we shall follow the arrangement laid down by Professor Drude in the "Natürliche Pflanzenfamilien"; in minor points only we found it convenient to introduce a few changes. We have chosen Professor Drude's system of classification in preference to the one adopted in Sir J. Hooker's "Flora of British India" for entirely practical reasons. As we include in our description a great number of exotic species, the plan given by Professor Drude seemed to simplify matters considerably. In order to give the series not only scientific interest but also practical value, we shall add to the description of the species an account of their economic uses and, besides, a few notes on their cultivation. We cannot lay claim to the practical experience of a gardener and have, therefore, to rely in this matter on the remarks scattered in various books on gardening. As many of the palms described below have been introduced into European Conservatories, we hope that some hints on palm-growing in Europe will be welcome.

In order to avoid, on the one hand, too frequent references to authorities in the text, and on the other to indicate the books where those desirous of further information may easily find it, we shall give a list of the literature on palms at the end of the introductory chapter. Later on all the references to botanical authors will be given in their usual abbreviated form. In the interest of those who are not familiar with the ways of botanists, we shall add a list of the authors with the abbreviations commonly used in botanical works.

We are fully aware of many imperfections regarding the treatment of our subject. Those who have ever made, or tried to make, a special study of palms will realise the many difficulties that lie in the way of such an undertaking. We shall always be very thankful for any suggestions or corrections.

Our sincere thanks are due to Captain Gage, the Director of the Botanical Survey of India, and Mr. H. F. MacMillan, the Curator of the Royal Botanic Gardens at Peradeniya, who have supplied us with a considerable number of photographs which otherwise we should not have been able to secure. To Mr. MacMillan we are, moreover, indebted for his valuable suggestions. We owe another set of photographs to the kindness of Mr. Phipson, the former Honorary Secretary of the Bombay Natural History Society, to the Rev. Max

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Maier, S. J., and to Mr. Roscoe Allen. Mr. Lock, the Assistant Director of the Royal Botanic Gardens at Peradeniya, obliged us by putting the library and herbarium of the Gardens at our disposal. Lastly, we would express our thanks to Mr. Millard, the Honorary Secretary of the Bombay Natural History Society. Without his practical and untiring interest in the subject we should never have been able to start this series.

A SHORT HISTORY OF THE EXPLORATION OF THE INDIAN PALM-FLORA.

Alexander von Humboldt[1] wrote in the year 1849 : " It is remarkable that of this majestic form of plants (palms) up to the time of the death of Linnæus only 15 species were described. The Peruvian travellers Ruiz and Pavon[2] added to these 8 more species. Bonpland[3] and I, in passing over a more extensive range of country from 12° S. Lat. to 21° N. Lat., described 20 new species of palms, and distinguished as many more, but without being able to obtain complete specimens of their flowers. At the present time, 44 years after my return from Mexico, there are from the Old and New World, including the East Indian species brought by Griffith, above 440 regularly described species. The " Enumeratio Plantarum " of my friend Kunth, published in 1841, had already 356 species." It is evident from this account, that the progress made in the exploration of the palm-flora in general was a very slow one, and it cannot be expected that the knowledge of the Indian palms was much advanced at that time. In Rheede's " Hortus Malabaricus," which was finished in 1703, only those palms are described which have been cultivated in India from time immemorial (Areca catechu, Phœnix sylvestris, Borassus flabellifer, Cocos nucifera, etc.) Roxburgh's " Plants of the Coast of Coromandel " (1795—1816) contains only a few species, whilst

[1] A. v. Humboldt, Aspects of Nature in Different Lands and Different Climates, Vol. II 126. London, 1850. (Translated from the German.)

[2] Hipolito Ruiz Lopez, born in 1754, was in charge of the Botanic Garden of Madrid, and died in Madrid in 1815. He and Joseph Pavon undertook (1779-1788) a scientific tour through Peru, Chili, and the neighbouring Spanish Provinces. In a shipwreck they lost the greatest part of their botanical collections. The results of their travels were published in the " Flora Peruviana et Chilensis," Madrid, 1798-1802, and the " Systema vegetabilium floræ Peruvianæ et Chilensis." Madrid, 1798.

[3] Humboldt, in company with Bonpland, travelled in Spanish America between 1799 and 1804.

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his "Flora Indica", which appeared 17 years after his death (in 1832) brings the number of palms up to 41. At about the same time Wallich's "Plantæ Asiaticæ Rariores" (between 1830 and 1832) was published by the East India Company. Though valuable in other respects, the work did not add much to our knowledge of Indian palms.

It was not until Griffith with his untiring energy and enormous knowledge began his botanical investigations, that the palms of India became better known. As Assistant Surgeon he accompanied Wallich to Assam; he explored the tracks near the Mishmi Mountains between Sudiya and Ava; made a journey from Assam to Ava, and down the Irrawadi to Rangoon; traversed 400 miles of the Bhutan country; joined the Army of the Indus in a scientific capacity; went from Kabul to Khurasan and succumbed finally to the fatigue and sicknesses due to exposure during his long and restless journeys (1845). The various papers, including many on palms which he communicated to the "Calcutta Journal of Natural History" and to the Linnean Society of London, and his other publications, are models of scientific research. His drawings, microscopic analyses and descriptions of plants are evidence of astonishing industry and profound knowledge. For the fruits of these labours we are indebted to J. McClelland, who published in Calcutta, between 1847 and 1854, five volumes with a 4to volume of illustrations: "Posthumous papers bequeathed to the H. E. I. C., and printed by order of the Government of Bengal; being journals of travels by the late William Griffith, Esq., arranged by John McClelland, M.D." The most important amongst these is the volume entitled: "Palms of British East India" (1850). The author's preface furnishes some information regarding the scope and origin of the book. "The present attempt," says Griffith, "will be found to include all the Palms of British East India that I have met with myself, or of which I have been able to procure such knowledge, as I considered sufficient for their determination. I wish it merely to be viewed as a slight sketch to be filled up hereafter. This subject, so far as regards systematic botany, is one of considerable interest, and in order to meet the convenience of the Indian public, I have written the descriptions in English, in preference to the common language of Botanists. This seemed to me the more proper, because English is the language through which

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scientific knowledge is communicated in this country, more especially in the Medical and other Colleges, from which all that is to be expected in the dissemination of this science among the natives of India must at present be derived . . . The determination of the species having been difficult, indeed nearly insuperably so to me, in reference to the means possessed in India, the numerous names new to science proposed in this work, must be taken with some qualification. I shall never regret to see any of these names cancelled in favour of others justly prior, that is to say, prior by definition, and by publication. However imperfect the definition may be ; and it must be confessed, that most of those of palms are necessarily imperfect, still it bears evidence of a wish on the part of an author to do his duty by the science, for which, moreover, he thus endeavours to show a proper respect. But I would not be disposed to waive my right, in favour of mere MSS. names originating in indolence, and too often fostered by a courtesy of a very mischievous nature, inasmuch as the practice is directly opposed to proper observation and due discrimination. Such names are, in fact, only weak and temporary usurpations of authority."

The materials from which the work has been prepared were an extensive collection of palms made by Griffith himself and his friends in various parts of India, more especially at Malacca, and in Assam, and of a few found in the Botanic Gardens of Calcutta. To these we must add the species figured in Roxburgh's national collection of drawings and most of those described in his "Flora Indica." The species of Buchanan Hamilton, amounting to nine in number, Griffith has not been able to determine, in default either of manuscripts, specimens, or drawings. For the rest, Griffith has been much assisted, as he says himself, by Martius' great work on palms, so far as regards the sections, and from Mohl's contribution to it he derived most of what relates to structure. It was Griffith, on the other hand, that enabled Martius to describe in his 3rd volume a considerable number of Indian species, as only a few months before his death he had sent his whole collection of palms to Martius, who at that time was engaged in finishing his monumental "Historia Naturalis Palmarum."

During the lifetime of Griffith and especially in the second half of the 19th century, valuable work has been done in the exploration of the palm-flora by many botanists in various parts of India. We

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mention only Anderson, Thwaites, Scheffer, Kurz, Brandis, Trimen, Beccari, and especially J. D. Hooker, who in the VIth Volume of his "Flora of British India" (1894) gives a concise account of all the palms which had previously been found in India and to which he himself and Beccari were able to add some new species. Lately, Prof. Beccari has enriched the literature on palms by his magnificent monograph on the genus Calamus, and we can only hope that he will be able to continue and finish his great undertaking to describe and illustrate the Asiatic palms.

In spite of all the labour spent by many scientific men in the study of Indian palms, there still remains much to be done. A great number of species are only partially known; the knowledge of others is extremely scanty, and there are, besides, a few, of which we know only the name, the original not having been discovered as yet.

THE PALMS IN GENERAL.

The Stem.—The adult palm has generally a tall, woody stem, bearing a crown of leaves; a considerable number, however, remain shrubby and some even have quite the appearance, but nothing save the appearance of perennial herbs. The stems in some species hardly appear above ground, in others they rise to the height of 500 feet (Calamus). It is doubtful whether there exist entirely stemless palms. Not seldom we find in descriptions palms mentioned as stemless, but on closer examination we usually find that the stem is very short and covered all over with the bases of the stalks of fallen leaves and the dense crown of new leaves. In diameter the stems vary from the reed-like Chamædorea and slender Rattan to the more usual sturdy, pillar-like structure as seen in the Date-palm, Palmyra-palm, the Oreodoxa, the Talipot and many others. While in some the stem is hardly as thick as a goosequill, it measures in others from three to five feet in diameter (Borassus flabellifer, Corypha). The long, slender stems of the Rattans or cane-palms are not self-supporting, but scramble over the surrounding vegetation; but in most palms the stem exists quite independent of all other plants.

The trunks of some are almost perfectly smooth, others rough with concentric rings, the scars of the fallen leaves. Many are clothed with a woven or hairy fibrous covering, which binds together the sheathing bases of the fallen leaves; others are densely beset with

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cylindrical or flat spines, often eight or ten inches long and as sharp as a needle. As in these cases also the leaf-sheaths are covered with spines, such palms offer a serious obstacle to the traveller who attempts to penetrate the tropical forest.

Branching is a rare occurrence in the tall aërial stem. It is the rule only in a few species of the genus *Hyphœne (thebaica, coriacea,* and *indica).* In these palms the stem forks, often several times in succession, and there is no doubt that here we have cases of true dichotomy, similar to the mode of branching observed in *Pandanus furcatus* (Screw-pine). In ten other genera (out of a total of 131) exceptional cases of branching are recorded. These are often due to an injury to the terminal bud, as in the Wild Date, where the apex is continually tapped for toddy. In other cases branching takes place in consequence of the replacement of flowering buds by leaf-buds, which develop into shoots. Mr. F. Field gives a photograph of a Wild Date Palm with 14 branches (Journal, Bombay Natural History Society, Vol. XVIII, p. 699) that was growing at a village named Amas in the Gaya District, and he mentions that at one time the tree had been struck by lightning and split, and that from the base of the split those branches started.

The formation of horizontal suckers at the base of the stem is not so seldom. When they grow erect, they afford a characteristic bushy habit, as in the case of *Rhapis flabelliformis*, a species often cultivated in gardens.

The Leaf.—The foliage generally forms a magnificent crown at the end of the trunk. It is this crown that renders the palms objects of such beauty and elegance. The leaves are large and often gigantic, surpassing those of any other class of plants. In some species they are 50 feet long and 8 wide. We can easily distinguish two main types of leaves, the palmate and pinnate, which give rise to the popular terms Fan-palm and Feather-palm respectively. In the Fan-palms the blade is entire while enclosed in the bud, but folded up. When the leaf expands the folds become torn to a greater or less distance from the margin inwards. The depth of division varies much in different genera and species. In the pinnæ (leaflets, segments) of the Feather-palms we can observe similar characteristic foldings and tearings. The presence or absence of a terminal leaflet and the shape of the pinnæ in such a leaf afford useful distinctive

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characters. Occasionally, in the genus Caryota, these segments are again divided (bipinnatisect), their ultimate divisions resembling in shape the fin or tail of a fish.

The petiole (leaf-stalk) is usually large and stout and has a strong, broad, sheathing base. The leaf-fall is, as generally in Monocotyledons, not a predetermined process, as observed in dicotyledonous trees. After some time, when the leaf has reached the end of its life-period, it gradually falls over, as the weight of the large blade is too great for the dying petiole. The blade remains attached until the stalk becomes so decayed that the leaf falls by its own weight or gets broken off by wind or rain-storm. The sheath is often seen to persist for sometime, its tough fibres forming a dense matting round the bases of the younger leaves. In some genera (Calamus, Desmoncus) the stem is surrounded above the petiole by a sheath-like stipule, called ochrea. In a few species the ochrea forms a hollow smooth-walled chamber, in which ants make a home (*Korthalsia echinometra, scaphigera, scortechinii, wallichiæfolia*).

Within the leaf-sheath we often find stem-thorns, which are at first flattened upwards against the stem and spread only after leaf-fall. The stems and leaves of the Rattans often bear numerous recurved spines which aid them in scrambling over trees and bushes. Also the leaf-rachis (midrib) may be produced into a naked, barbed, whip-like flagellum.

The leaves are generally green on both sides, but occasionally of a silvery white on the underside (*Copernicia cerifera*). In rare cases blue the middle of some leaves shows concentric bands of yellow and in the manner of a peacock's tail, as in the prickly Mauritia.

Another important character is the direction of the leaves. The segments may be arranged in a comb-like manner close to one another, with a stiff parenchyma, allowing the rays of the sun to play over their surface, and causing them to shine with a brilliant verdure in the Cocoa-nut Palm, and with a fainter ashy-coloured hue in the Date-tree, or they have a more flexible, grass-like texture, and are curled near the extremity. The more acute the angle formed by the leaves with the upper part of the stem, *i.e.*, the nearer the leaves approach the perpendicular, the bolder and nobler is the aspect of the species to which they belong. A comparison between the Real Date Palm and the Wild Date Palm will show this sufficiently.

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In Feather-Palms the petioles either burst from the dry, rough, woody portion of the stem (*Cocos nucifera*, *Phœnix dactylifera*), or there rises in the rough part of the stem a grass-green, smooth, and thinner shaft, like one column above another, from which the petioles spring (*Oreodoxa regia*). A special character of melancholic solemnity and grandeur is added to the tree, when in Fan-Palms the living foliage rests on a circle of dead leaves.

There are various ways in which the leaf-blade protects itself against the influence of too intensive sun-light and the violent force of the rain. Fan-leaves as well as feathery leaves very often assume an inclined or even vertical position. This is effected either by the torsion of the petiole or by the leaf-stalk trying to get into a more upright position. It is not uncommon that the two rows of pinnæ are turned upwards till they form a small angle with each other (*Chrysalidocarpus lutescens*), and even the two halves of a fan-leaf are sometimes seen to close upon each other—just like a half-open book.

The Root.—After germination the primary root soon perishes and is replaced by adventitious roots springing from the base of the stem. In the South American genus Iriartea, development takes place above ground, the short stem being supported by prop-like adventitious roots, which increase in size with the increase in circumference of the shoot. The Sabal-Palm, Wax-Palm, and others, differ in that they form on the surface a short, horizontal rhizome, which becomes gradually thicker until the normal sized leaf-rosette is produced, when it begins to grow erect and forms the cylindrical stem. At the base the stem is often conically thickened. This gives the necessary mechanical rigidity, in consequence of which the stem does not curve in a gale but bends from the base, from a position like | to one like /. The mechanical physiology of stem and root is on the whole very little known. Why, *e.g.*, the stems of *Cocos* and other palms are curved—and not straight, we are not yet able to explain.

The Flower.—The flowers of a palm are never solitary; they always form a usually very large and much branched inflorescence. This is either a simple or compound spike, or a richly branched panicle. The branching is racemose and the flowers are often embedded in the fleshy surface of the branches; for this reason it is customary to call the inflorescence a spadix. In the Talipot and Metroxylon it is

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terminal; after many years' growth and the production of a stout woody trunk, the growing point ceases to produce leaves and develops a gigantic inflorescence. This so exhausts the plant that, after fruiting, it dies. In most cases, however, the spadix is axillary and withers away after fruiting. It is formed in the sheathed axil of a leaf but often does not develop until after the subtending leaf has fallen, when the spadix is therefore below the leaf-crown. In other cases again, as in the *Sabal mauritiæforme* the large flower-shoots appear among the green leaves. These relations are constant for every species, sometimes even for a whole genus.

Before the flowers open a sugary sap in considerable quantities flows to the large spadix. The inhabitants of the tropics learned in early times how to obtain that sap, which by fermentation changes into a favourite intoxicating drink, the toddy. Each spadix is enclosed in an often enormous spathe, or each branch is separately sheathed by smaller spathes. After some time the spathe becomes torn along definite lines by the rapidly growing flower-shoot and either separates completely at the base or remains to sheathe the stalk and lower branches.

The flowers are small and inconspicuous, generally of a white, pale-yellow, or green colour, but, as if to make up for this defect, they are mostly produced in such masses as to present an eminently striking and imposing appearance. A single spathe of the Date-Palm contains about 12,000 male flowers, and *Metroxylon rumphii* has been computed to have no less than 208,000 flowers in one spathe, or about 624,000 upon a single tree.

The flowers are sessile or sometimes embedded in the surface of a fleshy spadix, as in the male inflorescence of the Brab Tree (*Borassus*). They are arranged in a close or loose spiral, or more rarely are distichous. As a rule the flowers are unisexual, the male and female often occupying different parts of the same inflorescence, *e.g.*, a few females occur at the base of the branches, whilst the upper part is thickly crowded with males, or the branches of the spike bear female flowers in the lower and male in the upper half. In other species, the two sexes may be mixed, usually one female between two males. In this case the two male flowers appear in succession and then the female, so that the spike is for the time being unisexual. The male and female flowers may vastly differ in size, as in the Brab Tree where the enormous female flowers contrast strongly with the minute male.

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The flowers are regular and follow the very general formula of monocotyledonous plants. We have therefore usually 3 sepals, 3 petals, 6 stamens or a multiple of it, and 3 carpels for the exceptional hermaphrodite flower, while the stamens are rudimentary (staminodes) in the female and the carpels in the male (pistillode). The sepals and petals are tough and persistent, leathery or fleshy in their structure. The sepals are generally smaller than the otherwise similar petals, and only in rare cases is the corolla entirely covered by the calyx. Sometimes a whorl of stamens is wanting, or there is an indefinite number. The powdery pollen is produced in great quantities, escaping in clouds from the large male spikes. The pollination-methods of the palms want investigation. Wind-pollination is probably most general, as *e.g.*, in the Cocoa-nut Palm, though some palms, *e.g.*, *Sabal* and *Chamædorea*, are said to be entomophilous. The sweet smell of the inflorescence and the great mass of flowers which form a conspicuous object, seem to be in favour of insect-pollination. Where the male and female flowers are close together on the same spike, self-pollination is excluded by the well-marked protandry which we have already mentioned.

The ovary consists almost throughout of 3 carpels which are either quite free or completely united. In the latter case the ovary is generally trilocular. The style is short and the ovules, one for each carpel, are either anatrapous, hemitropous, or rarely orthotropous.

Fruit and Seed.—When the fruit ripens, two of the carpels with their ovules may become abortive, as *e.g.*, in the Cocoa-nut, where we find only one seed, though the three carpels are distinctly indicated by three longitudinal sutures and by the constant presence of three round scars (germ-pores) on the hard endocarp. The fruit is either a berry or a drupe ; in the latter case the endocarp is usually united to the seed. If the carpels are free, a syncarp of one-seeded fruits results ; if they are united, we shall have a single fruit with one, two or three seeds according to the number of ovules that develop. The fruit in *Lepidocaryinæ* (including the Rattans, the Sago-palm, and others) is covered with hard, closely fitting, generally smooth, imbricating scales.

Compared with the size of the plants, the fruits are generally small ; some are in this respect like peas, as in the Euterpe of tropical America. The common Cocoa-nut is one of the largest ; and the

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Double Cocoa-nut (*Lodoicea sechellarum*), measuring about four feet in circumference, is probably surpassed by no other fruit hitherto discovered.

In the seeds we observe a similar variety in size and shape. In fruits which contain only one seed it is generally more or less rounded, as in the Cocoa-nut; in the Date it is long and narrow. In fruits with three seeds, it often becomes flattened on two sides and rounded on the outer in consequence of mutual compression.

The point on the testa from which well-marked vascular bundles radiate, shows the position of the raphe or chalaza. The inner integument of the ovule is, in some genera, much thickened along the course of these bundles and becoming greatly increased during ripening, grows into the endosperm and produces the characteristic appearance in section known as ruminate. This can be seen in the Betel-nut. Within the thin, fibrous seed-coat there is a copious endosperm which holds embedded in some part of its circumference the minute cylindrical or conical embryo. The endosperm may be comparatively soft, the cells containing a considerable amount of oil and proteid (Cocoa-nut), or it may be hard (Date), or occasionally mucilaginous.

Geographical Distribution.—There are about 1,100 known species of palms which are distributed among 131 genera. They form a monocotyledonous order, essentially characteristic of the tropical region *(cf. Map A.)*. *Chamærops humilis* is the only native of Europe; it is a Mediterranean species which occurs in Southern Spain, Italy, and Greece. The monotypic genus Nannorhops which is indigenous on the Himalayas extends through Afghanistan and Baluchistan to south-east Persia. Of the Chinese-Japanese region, only the east-coast, as far as Korea and the south of Japan, shows some representatives of this order. A few small genera are peculiar to the Southern United States and California. The Chilian genus Jubæa extends to the 37th parallel, while in the eastern hemisphere the southern limit is 44° S. Lat. in New Zealand. The great centres are tropical America and tropical Asia. The order is represented in Central America by 7 genera, in the West Indies by 5, and extends southwards as far as Chili. In tropical Asia it covers the Indo-Malayan region, Borneo, New Guinea and Australia, always within the northern and southern limits indicated above. In tropical Africa

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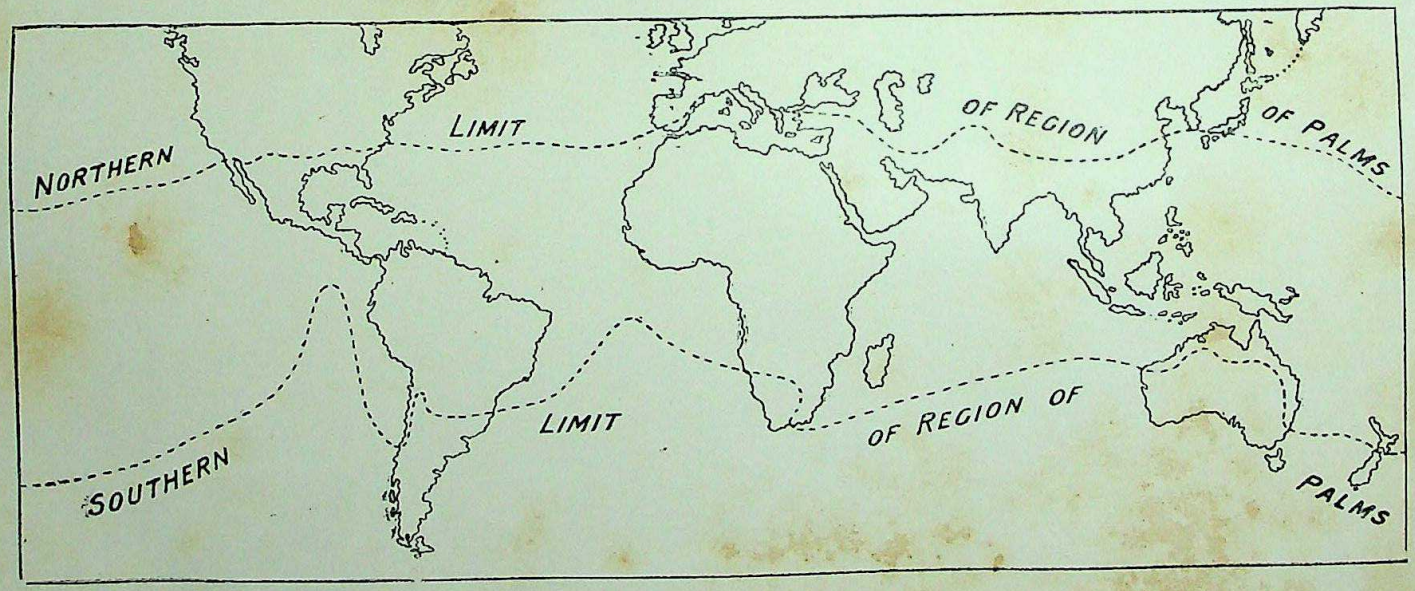

MAP SHOWING THE LIMITS OF THE REGION OF PALMS.

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only 14 species are known to occur. Several genera have been found in the Pacific Islands.

Drude has shown that, with the exception of three genera, all the rest are restricted either to the Old or to the New World. Of those three the Cocoa-nut has a wide distribution on the coasts of tropical America, in India and the South Seas, but all its allies are American. The Oil-palm (*Elæis guineensis*) is indigenous in western tropical Africa, whilst another species of the same genus is a native of equatorial Africa. One species of Raphia belongs to America, whilst several others have their original home in tropical Africa and Madagascar.

The following table gives all the genera of palms with the number of species and their distribution. An asterisk indicates that the genus is represented by indigenous species in India and Ceylon: two asterisks, that representatives of the respective genus are cultivated in Indian gardens.

TRIBE 1.—CORYPHINÆ.

1. *Phœniceæ.*

1. * Phœnix, L. Sp. about 12, Sub-tropical Africa; Tropical Asia.

2. *Sabaleæ.*

2. ** Chamærops, L. Sp. 2, Mediterranean region.
3. * Trachycarpus, Wendl. Sp. 3, Northern India, Burma; Northern China; Japan.
4. Rhapidophyllum, Wendl. & Dr. Sp. 1, Florida, South Carolina.
5. ** Rhapis, L. Sp. 3, Eastern Asia, from China to the Sunda Islands.
6. Acanthorhiza, Wendl. & Dr. Sp. 4, Tropical America.
7. Colpothrinax, Griseb. & Wendl. Sp. 1, Cuba.
8. Trithrinax, Mart. Sp. 4, South America.
9. ** Thrinax, L. Sp. 9, Antilles; Florida.
10. * Corypha, L. Sp. 6, Tropical Asia, Malay-Archipelago.
11. * Nannorhops, Wendl. & Hook, Sp. 1, India; Afghanistan; S. Persia.
12. * Licuala, Wurmb. Sp. about 45, Indo-Malayan region; New Guinea; North Australia.
13. * Livistona, R. Br. Sp. about 13, Indo-Malayan region; New Guinea; East Australia.
14. Erythea, Wats. Sp. 2, South California and Guadalupe Island.
15. ** Pritchardia, Seem. & Wendl. Sp. 5, Sandwich Islands.
16. ** Washingtonia, Wendl. Sp. 2, South California and Arizona.
17. Brahea, Mart. Sp. 2, Mexico; South Texas.

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18. Crysophila, Bl. Sp. 1, Mexico.
19. ° ° Sabal, Adans. Sp. 7. from Venezuela to the Antilles and the South-Eastern States of North-America.
20. Serenæa, Hook. f. Sp. 1, Florida.
21. ° ° Copernicia, Mart. Sp. 6, America.
22. Teysmannia, Zoll. Sp. 1, Sumatra.

TRIBE II.—BORASSINÆ.

3. *Borasseæ.*

23. Pholidocarpus, Bl. Sp. 5, Amboina ; Timor, Borneo.
24. Medemia, P. Guil. de Wuertt. & Braun. Sp. about 4, East Africa.
25. ° Hyphæne, Gaertn. Sp. 10, Africa, India.
26. ° ° Latania, Comm. Sp. 3, Mascarene Islands and neighbouring coast of Africa.
27. ° Borassus, L. Sp. 1, Tropical Africa ; India, from Ceylon to the Sunda Islands.
28 ° ° Lodoicea, Labill. Sp. 1, Sychelle Islands.

TRIBE III.—LEPIDOCARYINÆ.

4. *Mauritieæ.*

29. Mauritia, L. f. Sp. 9, Northern Brazil ; Guiana ; West Indies.
30. Lepidocaryum, Mart. Sp. 5, Northern Brazil ; Guiana.

5. *Metroxyleæ.*

31. ° ° Raphia, P. de B. Sp. 6, Tropical Africa ; Madagascar ; Tropical America.
32. Oncocalamus, Wendl. & Mann. Sp. 1, West Africa.
33. Ancistrophyllum, Hook. Sp. 3, West Africa.
34. Eremospatha, Wendl. & Mann. Sp. 3, West Africa.
35. Eugeissona, Griff. Sp. 2, Malay-Archipelago.
36. ° ° Metroxylon, Rottb. Sp. 7, Malay-Archipelago ; New Guinea.
37. Pigafetta, Bl. Sp. 3, Malay-Archipelago ; New Guinea.
38. ° Zalacca, Reinw. Sp. 10, Assam ; Malay-Archipelago.
39. ° Korthalsia, Bl. Sp. 20, Malay-Archipelago ; New Guinea.
40. Ceratolobus, Bl. Sp. 2, Sumatra ; Java.
41. ° Plectocomia, Mart. Sp. 6, Khasya Hills ; Himalaya ; Assam ; Malay-Archipelago.
42. ° Plectocomiopsis, Becc. Sp. 3, Malayan.
43. ° Calamus, L. Sp. about 170, Tropical and Sub-tropical Asia ; Tropical West-Africa ; Australia.
44. ° Dæmonorhops, Bl. Sp. about 80, Tropical and Sub-tropical Asia.

TRIBE IV.—CEROXYLINÆ.

6. *Arecineæ.*

45. ° Caryota, L. Sp. about 10, tropical Asia, Malay-Archipelago, Australia.

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46. ° Arenga, Labill. Sp. about 10, Tropical Asia ; Malay-Archipelago ; New Guinea ; Australia.
47. ° Didymosperma, W. & Dr. Sp. 8, East India ; Malay-Archipelago.
48. ° Wallichia, Roxb. Sp. 3, East India.
49. Orania, Sp. 5, Malay-Archipelago ; Papua.
50. Podococcus, Wendl. & Mann. Sp. 1, West-Africa.
51. Sclerosperma, Wendl. & Mann. Sp. 1, West-Africa.
52. ° Bentinckia, Berr. Sp. 2, Travancore ; Nicobar Islands.
53. Manicaria, Gaertn. Sp. 1, Tropical America.
54. Leopoldinia, Mart. Sp. 4, Brazil.
55. Calyptronoma, Griseb. Sp. 4, Tropical America.
56. Geonoma, Willd. Sp. about 80, Tropical America.
57. Asterogyne, Wendl. Sp. about 2, Central America.
58. Calyptrogyne, Wendl. Sp. 3, Central America.
59. Welfia, Wendl. & Hook. Sp. 2, Central America.
60. Iriartea, R. & Pav. Sp. about 10, Tropical America.
61. Catoblastus, Wendl. Sp. 3, Columbia ; West Brazil ; Peru.
62. Wettinia, Pœpp. & Endl. Sp. 3, Andes.
63. Ceroxylon, H. B. Kth. Sp. 5, Andes.
64. Juania, Dr. Sp. 1, Juan Fernandez.
65. ° ° Chamædorea, Willd. Sp. about 60, Tropical America.
66. Morenia, R. & P. Sp. 5, Andes.
67. Kunthia, Humb. & Bonpl. Sp. 1, North-West Brazil ; Columbia
68. ° ° Hyophorbe, Gaertn. Sp. 3, Mascarene Islands.
69. Gaussia, Wendl. Sp. 1, Cuba.
70. Pseudophœnix, Wendl. & Dr. Sp. 1, South Florida.
71. Synechanthus, Wendl. Sp. 3, Central America ; Columbia.
72. Reinhardtia, Liebm. Sp. 8, Central America ; Mexico.
73. ° ° Dypsis, Noronh. Sp. 6, Madagascar.
74. Phloga, Hook. Sp. 1, Madagascar.
75. Hyospathe, Mart. Sp. 3, Tropical America.
76. Prestœa, Hook. Sp. 1, Trinidad.
77. ° ° Oreodoxa, Willd. Sp. 6, Tropical America.
78. Gigliolia, Becc. Sp. 2, Borneo.
79. ° ° Howea, Becc. Sp. about 3, Lord Howe's Island.
80. Linospadix, Wendl. & Dr. Sp. 6, New Guinea ; east coast of Australia.
81. Iguanura, Bl. Sp. 10, from Malacca to Borneo.
82. Calyptrocalyx, Bl. Sp. 2, Moluccas ; Australia.
83. Sommieria, Becc. Sp. 2, Papua-Archipelago.
84. Clinostigma, Wendl. Sp. 3, Samoa ; Lord Howe's Island.
85. ° ° Heterospathe, Scheffer Sp. 1, Amboina.
86. Jes enia Karst. Sp. 3, South America.
87. Roscheria, Wendl. Sp. 1, Sey :helles

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88. ° ° Nephrosperma, Balf. Sp. 1, Seychelles.
89. ° ° Verschaffeltia, Wendl. Sp. 1, Seychelles.
90. ° ° Phœnicophorium, Wendl. Sp. 1, Seychelles.
91. ° ° Deckenia, Wendl. Sp. 1, Seychelles.
92. ° ° Acanthophœnix, Wendl. Sp. about 3, Mascarene Island.
93. ° Oncosperma, Bl. Sp. 4, Tropical Asia.
94. Euterpe, Mart. Sp. about 10, Tropical America ; West Indies.
95. Œnocarpus, Mart. Sp. 8, Tropical America.
96. Ptychandra, Scheff. Sp. 2, Moluccas.
97. Cyphokentia, Brongn. Sp. 10, New Caledonia.
98. ° ° Hydriastele, Wendl. and Dr. Sp. 1, tropical north-coast of Australia.
99. ° ° Kentia, Bel. Sp. 10, Moluccas ; New Guinea ; Lord Howe's Island ; Norfolk Island ; New Zealand ; Chatham Islands.
100. Kentiopsis, Brongn. Sp. 2, New-Caledonia.
101. Veitchia, Wendl. Sp. 4, New Hebrides ; Fiji Islands.
102. Drymophlœus, Zipp. Sp. 12, Malay-Archipelago ; New Guinea ; New-Caledonia ? Australia ?
103. ° ° Cyrtostachys, Bl. Sp. 2, Malay-Archipelago.
104. Ptychococcus, Becc. Sp. 3, New Guinea ; Moluccas.
105. ° ° Ptychosperma, Labill. Sp. 13, Sunda Islands ; Papua-Archipelago ; Fiji Islands ; North Australia.
106. ° Loxococcus, Wendl. & Dr., Sp. 1, Ceylon.
107. ° ° Actinorhytis, Wendl. & Dr., Sp. 1, Malay-Archipelago.
108. Rhopaloblaste, Scheff. Sp. 2, Moluccas ; New Guinea.
109. ° Ptychoraphis, Becc. Sp. 3, Malayan.
110. ° ° Dictyosperma, Wendl. & Dr., Sp. 3, Mascarene Islands.
111. ° ° Archontophœnix, Wendl. & Dr., Sp. 3, Tropical and Sub-tropical East-Australia.
112. Nenga, Wendl. & Dr., Sp. about 11, from Malacca and the Sunda Islands to New Guinea.
113. Cyphophœnix, Wendl. & Hook., Sp. 2, New Caledonia.
114. Mischophlœus Scheff., Sp. 1, Ternate.
115. ° Pinanga, Bl. Sp. about 40, India ; Malay-Archipelago.
116. ° Areca, L. Sp. 14, Tropical Asia; Malay-Archipelago; New-Guinea; Australia.

7 *Cocoineæ.*

117. Barcella, Trl. Sp. 1, Brazil.
118. ° ° Elæis, Jacq. Sp. 2, Tropical Africa and America.
119. Orbignya, Mart. Sp. 6, South America.
120. ° ° Attalea, H. B. Kth., Sp. 23, Tropical America.
121. ° ° Maximiliana, Karst. Sp. 3, Tropical Brazil ; Guyana ; Trinidad.
122. ° Cocos, L. Sp. about 30, Tropical and Sub-tropical America.

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123. Diplothemium, Mart. Sp. 5, Brazil.
124. Jubæa, Gay, Sp. 1, Chile, 31-35° S. Lat.
125. ° ° Martinezia, Kth. Sp. 7, Tropical America.
126. ° ° Acrocomia, Mart. Sp. 7, Tropical America.
127. ° ° Astrocaryum, Mey. Sp. 29, Tropical America ; Brazil,
128. ° ° Bactris, Jacq. Sp. 90, Tropical America.
129. Desmoncus, Mart., Sp. about 25 Tropical America.

TRIBE V. PHYTELEPHANTINÆ.

130. ° ° Phytelephas, R. & P. Sp. 3, Tropical America, between 9° N. Lat. and 8° S. Lat.
131. ° Nipa, Thunb. Sp. 1, Tropical Asia ; New Guinea ; Australia.

DISTRIBUTION OF PALMS IN BRITISH INDIA.

Roughly speaking about a hundred species have been described as being indigenous to British India and Ceylon ; certainly a small number if compared with many regions in tropical America. Nearly all of them are comparatively unobtrusive, and if a traveller in India meets palms forming a conspicuous feature in the landscape of the plains, he may be sure that the trees are either Wild Date-Palms (*Phœnix sylvestris*) or Palmyra-Palms (*Borassus flabellifer*), or, near the sea, Cocoa-nut Palms (*Cocos nucifera*). The most majestic palm of India and easily distinguished by its stature, foliage and inflorescence, is the Talipot (*Corypha*), but it is exceedingly rare and confined to certain localities.

A short survey of the botanical regions of India, as laid down by Sir Joseph Hooker, will reveal some interesting facts regarding the distribution of Palms.

We begin with the Burmese region, which is richest in species, not only regarding its whole vegetation, but also as to its palm flora. According to Sir J. Hooker, the region is bounded on the north and north-east by the flanking mountains to the south of the Assam valley and China, on the east by China and Siam, on the west by Bengal and the Indian Ocean, and on the south by the State of Khedah in the Malay Peninsula. We include here also the Andaman and Nicobar Islands. Up to 70 species have been recorded from this region, of which, according to our present knowledge of the neighbouring countries 28 are endemic.

We may divide this botanical region into four sub-regions, Northern, Western, Eastern, and Central, to which we shall add, in the

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meantime, the two separate sub-regions of the Andaman and Nicobar Islands. Northern Burma extends for 500 miles in a north-eastern direction from the great bend of the Brahmaputra in Bengal to the Chinese Province of Yunnan. The range of mountains flanking the Assam valley on the south forms its northern boundary. It belongs politically to Assam and comprises the districts known as the Garo, Khasya, Jaintia, Nowgong, Naga, Patkai, and Manipur Hills. They rise, on the average, to 4,000 to 5,000 feet, a few peaks even above 10,000. Blanford's description of the climate of Shillong gives on the whole a fair idea of the meteorological condition of this sub-region. "This station is situated on a gently undulating tableland, 4,800 feet above the sea-level, immediately north of the culminating ridge of the Khasi hills, and about midway between the valley of Assam and the plains of Sylhet. . . On the average of the 4 years, 1869-1872, the mean temperature of Shillong was 62°, which is about the same as that of Constantinople, Barcelona, and Oran: in fact of an average Mediterranean climate. In the warmest months, June to August, it is below 70°, and in April and May intermediate between the two, since in the Khasi Hills rain is so frequent in the spring months that the temperature does not rise to a maximum in May, and suffers no abatement when the monsoon rains set in in June. The lowest reading recorded was just above the freezing point; the average minimum of the 4 years 34°, and the mean temperature of December and January 51°. In December and January, the most serene months of the year, the mean difference of the early morning and afternoon temperatures is 19° or 20°. While in respect of temperature, the climate of Shillong much resembles that of places in the south of Europe, in the dampness of its atmosphere and its rainfall it is eminently tropical. In the driest month, March, the humidity is indeed only 59 per cent. of saturation, but from July to October inclusive it ranges between 86 and 89, and from June to September, on an average, eight-tenths or more of the sky is clouded. In April it rains on one day in three, in May on two days out of three, and in the four succeeding months even more frequently. On the average of 18 years there have been 150 rainy days in the year. The average rain-fall of the year hardly exceeds 85 inches."[1]

[1] Blanford, Climates and Weather of India, p. 112.

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To this sub-region are exclusively confined the following species: *Areca nagensis*, *Pinanga griffithii*, *P. hookeriana*, *Didymosperma nana*, *D. gracilis* and *Plectocomia khasyana*. Of other species we find *Pinanga gracilis*, *Wallichia densiflora*, *Didymosperma nana*, *Caryota urens*, *Caryota obtusa*, *Phœnix rupicola*, *P. acaulis*, *P. humilis*, *Licuala peltata*, *Livistona jenkinsia*, *Trachycarpus martiana*, *Calamus erectus*, *C. flagellum*, *C. leptospadix*, *C. floribundus*, *C. acanthospathus*, *C. gracilis*, *Dæmonorops jenkinsianus*, *Zalacca secunda*.

Western Burma includes the humid strip of land between the sea and the crests of the Chittagong and Arakan Hills, and separated by the deltas of the Irrawaddy, Sittang, and other rivers, the coast of Tenasserim down to Mergui. The mean temperature of Chittagong is 77°. April and May are about equally hot, *viz.*, 81° and 82° and it remains nearly uniform from April to the end of September, the night temperature rising in the same measure as the day temperature falls, until the daily range is reduced by one-half, more or less. The highest temperature of the year occurs in April, or, more frequently in May, and varies between 91° and 99°. In the cool season the lowest temperature occurs as a rule in January, sometimes in February, and varies between 45° and 52°. The diurnal range of temperature in the drier seasons of the year does not exceed 23°. The humidity of the air averages 80, and in the driest month, either February or March, is as high as 70. At the height of the rains the humidity averages 87 per cent. and upwards. The rainfall amounts on an average to 106 inches and the number of rainy days to 122. "The position and configuration of Arakan and Tenasserim on the west coast of the peninsula, with hill ranges running parallel with the coast, expose them to the influence of the south-west monsoon of the Bay of Bengal, in the same manner and as fully as are the Konkan and Malabar to that of the Arabian Sea, and with a similar result, *viz.*, an excessive rainfall from June to September. In Arakan, however, this rainfall is more prolonged than on the west coast of the Konkan in the same latitudes." (Blanford). Dense, evergreen forests cover this tract of country, Dipterocarps, Oaks, Bamboos, Orchids, Palms, and Ferns forming a conspicuous feature. In Chittagong occur *Wallichia densiflora*, *W. caryotoides*, *Calamus erectus*, *C. viminalis*, *C. tenuis*, *C. guruba*, *C. gracilis*, and *Dæmonorops jenkinsiannus*, in Tenasserim *Licuala longipes*, *L. speciosa*, *Calamus concinnus*, *C. jeanus*, *C.*

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nitidus, *C. platyspathus*, *C. myrianthus*, *C. melanacanthus*, *C. palustris*, and *Plectocomia macrostachya*. Spread all over the sub-region, from Chittagong to Tenasserim, we find *Areca triandra*, *Pinanga gracilis*, *Caryota urens*, *Nipa fruticans* and *Calamus latifolia*. In Pegu the following species have been found :—*Pinanga hexasticha* (endemic in Pegu), *P. hymenospatha* (endemic), *Wallichia disticha*, *Arenga saccharifera*, *Livistona speciosa*, *Calamus arborescens* (endemic), *C. longisetus*, *Zalacca beccarii*, *Plectocomiopsis paradoxus*, and others.

The sub-regions Eastern and Central Burma are little known, and no materials are at our disposal.

Of the Andaman Islands, only a few points have been explored by botanists, of which the chief is Port Blair. Barren Island, Narcondam and the Coco have been visited by Major Prain. The climate of these islands is almost equatorial in its uniformity, and in many respects similar to that of Tenasserim. They are hilly, the hills being for the most part only a few hundred feet in height, and covered with forests, which are typically Burmese. The vegetation of the interior hills, which reach 2,400 feet in height, is not known at all. The mean temperature of Port Blair is 80°. There is but little variation during the year ; March and April are the warmest months, with a mean temperature of 82°, and a mean daily maximum of 92°. The average extreme range of temperature in the course of the year is only 26°. The diurnal range of temperature is as much as 14° or 15° in the driest months, February, March, and April. The mean humidity is 83 per cent. of saturation. The monsoon sets in in May and the rainfall of that month is little less than that of June. The number of rainy days amounts to nearly half the days in the year, and during the summer monsoon there are only 5 or 6 rainless days in the month. A comparatively considerable number of palms have been recorded from the Andaman Islands. *Areca triandra*, *Pinanga manii*, *Pinanga kuhlii*, *Caryota mitis*, *Phœnix paludosa*, *Corypha umbraculifera*, *Licuala peltata*, *L. spinosa*, *Calamus longisetus*, *C. viminalis*, *C. andamanicus*, *C. palustris*, *Dœmonorops manii* (endemic), *D. kurzianus* (endemic), *Korthalsia laciniosa*.

The flora of the Nicobar Islands is even less known than that of the Andaman Islands. Climatically there is not a great difference between the two groups of Islands, and as to the vegetation of the Nicobars, we cannot decide at present whether it belongs to the

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Burmese or to the Malay Peninsular flora. Four species of palms are endemic in these Islands, *viz.*, *Ptychoraphis augusta*, *Bentinckia nicobarica*, *Calamus nicobaricus* and *C. unifarius*; two species are endemic in the Nicobar and Andaman Islands: *Pinanga manii* and *Calamus andamanicus*.

Of the Eastern Himalayan region, only Sikkim is botanically well known. Its proximity to the Bay of Bengal and the direct exposure to the effects of the south-west monsoon make the district the most humid part of the whole range of the Himalayas. The total number of species of flowering plants is estimated to be about 4,000, of which only 20 are palms. Of these, only 2 inhabit the temperate zone (from 6,500-11,500 feet): a scandent Rattan (*Plectocomia himalaica*) and a Fan-Palm (*Trachycarpus martiana*). The rest belong to the tropical zone (1,000-6,500 feet). At the lowest elevations we find *Phœnix rupicola*; *Pinanga gracilis* and *Wallichia densiflora* reach as high as 3,000 feet, *Calamus erectus*, *C. flagellum* up to 4,000, *Caryota urens* up to 5,000, *Calamus acanthospadix* up to 6,000. Other palms belonging to the same zone are *Wallichia disticha*, *Licuala peltata*, *Calamus leptospadix* and *Dæmonorops jenkinsianus*.

The Western Himalayan region, which extends from Kumaon to Chitral has a much cooler and drier climate than the Eastern Himalaya. In consequence of it we find that 12 of the eastern species of palms have entirely disappeared in the western region. In the temperate zone there occurs only one species (a Trachycarpus) which is confined to and local to Kumaon and Garhwal. Five others belong to the tropical zone of Kumaon, *viz.*, *Phœnix sylvestris*, *P. acaulis*, *P. humilis*, *Wallichia densiflora* and *Calamus tenuis*, all of which have a very wide distribution.

In the Indus Plain region, including the Punjab, Sind, and Rajputana, west of the Aravalli range and Jumna river, Cutch, and Northern Gujarat, the only indigenous palms are *Phœnix sylvestris* and *Nannorhops ritchieana*. The latter finds its north-eastern limit in the Salt range, and the south-western limit in Sind and Baluchistan.

The Gangetic Plain region stretches from the Aravalli hills and Jumna river to Bengal, including the Sundarbans, the plains of Assam and Sylhet, and the low country of Orissa north of the Mahanadi river. Hooker has divided this region into three sub-regions: an upper dry, a lower humid, and the Sundarbans. In the upper

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Gangetic plain, extending from Eastern Rajputana to a little above the bend of the Ganges at Rajmahal, we have a vegetation characteristic of a dry country. The trees are, for the most part, leafless during the hot season, and the herbaceous flora is burnt up. Two palms are cultivated in many parts (Phœnix and Borassus), and in thickets we find two species of Rattan (Calamus). The lower Gangetic plain or Bengal proper of the old maps is distinguished from the upper valley by its humidity and luxuriant evergreen vegetation. The Betel-nut palm, Phœnix, Palmyra, and Cocoanut are generally cultivated. Of indigenous palms, the following are found, *Corypha elata*, *C. talliera*, *Calamus viminalis*, *C. tenuis*, *C. guruba*, *Dæmonorops jenkinsianus*. The Sundarbans consist of a great number of islets which, in great part, are covered with a dense evergreen forest of trees and shrubs with a rich undergrowth of climbers and herbaceous plants. *Nipa fruticans* is gregarious in the swamps and on river banks, whilst *Phœnix paludosa* is found in drier localities. There occur, also two Rattans, a Calamus and a Dæmonorops, both common to Bengal.

The Malabar region (including Southern Gujarat, the southern half of Kathiawar, the Konkan, Kanara, Malabar Proper, Cochin, Travancore, and the Laccadive Islands) is for the greatest part a hilly or mountainous country and "is (except in the north) of excessive humidity, the mountains often rising abruptly from the flat coast of the Arabian Sea. Its abrupt western face is clothed with a luxuriant forest vegetation of Malayan type, except towards the north where, with the drier climate, the elements of the Deccan and Indus Plain Floras compete with that of Malabar. The eastern face slopes gradually into the elevated plateau of the Deccan, but it is varied by many spurs being thrown off which extend far to the eastward, often enclosing valleys with a Malabar Flora. One great break occurs in the chain in lat. 11°N., where a transverse valley separates Travancore from the mountains north of it, and carries species characteristic of the Malabar Flora almost across the Peninsula." (Hooker).

To this region, including the Nilgiri Hills, belong over 20 species of palms. *Pinanga dicksonii*, *Bentinckia coddapanna*, *Calamus rheedii*, *C. huegelianus*, *C. brandisii*, *C. gamblei* are endemic. Of other palms we mention: *Phœnix sylvestris*, *P. robusta*, *P. acaulis*

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P. humilis, *Caryota urens*, *Calamus pseudotenuis*, *C. thwaitesii*, *Corypha umbraculifera*. *Areca catechu*, *Borassus flabellifer* and *Cocos nucifera* are widely cultivated.

The Deccan region comprises the whole comparatively dry elevated tableland of the Peninsula east of Malabar and south of the Gangetic and Indus Plains. The Coromandel coast, extending from Orissa to Tinnevelly may be considered as a sub-region. Deciduous forests form the most conspicuous feature of the Deccan plateau. Comparatively evergreen ones are found on the coasts and slopes with an eastern aspect. Of palms, there occur *Phœnix sylvestris*, *P. robusta*, *P. acaulis*, *P. humilis*, *Calamus viminalis*, *C. pseudotenuis*, *C. rotang*, *Borassus flabellifer*. *Phœnix pusilla* forms impenetrable thickets in sandy soils near the sea.

The Ceylon region presents, on the one hand, a close affinity to the vegetation of Malabar and the Deccan, on the other it differs from the Malabar flora in having many more Malayan types. Of endemic species 780 have been reported, and of these eleven are palms: *Areca concinna*, *Loxococcus rupicola*, *Oncosperma fasciculata*, *Phœnix zeylanica*, *Calamus rivalis*, *C. pachystemonus*, *C. digitatus*, *C. radiatus*, *C. zeylanicus*, *C. ovoideus*. The most conspicuous palm in Ceylon is *Corypha umbraculifera*: *Nipa fruticans* is rare. Other indigenous palms are *Phœnix pusilla*, *C. thwaitesii*, *C. pseudotenuis*, *C. delicatulus*, *C. rotang*.

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Aiton (Ait.) 1766-1849.
Anderson (T. Anders.)

Baker (Bak.).
Balfour (Balf.), 1808-1884.
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(*To be continued.*)

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A POPULAR TREATISE ON THE COMMON INDIAN SNAKES.

ILLUSTRATED BY COLOURED PLATES AND DIAGRAMS.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

Part XIII with Plate XIII and Diagram.

(Continued from page 792 of Volume XIX).

The vipers constitute a family (*Viperidæ*) characterised by the

THE COMMON SNAKES OF INDIA.

BY

MAJOR F. WALL, I.M.S.

PLATE XIII. (*Ancistrodon himalayanus* and *Psammodynastes pulverulentus*) not having arrived from England, will be published in the next number of the Journal.

EDITORS.

possession of large shields of the colubrine type on the top of the head, and the absence of a rattle at the end of the tail. It contains eleven species, seven of which are American, three Asian, and one European.

History.—It was first described by Dr. Günther in 1864.

Nomenclature.—(*a*) *Scientific.*—The generic name from the Greek "agkistron" a hook, and "odous" a tooth was introduced by de Beauvois in 1799.

From the derivation, and the fact that the godfather of the genus spelt the name *agkistrodon*, it seems a pity that the word has been

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Part XIII with Plate XIII and Diagram.

(Continued from page 792 of Volume XIX).

The vipers constitute a family (*Viperidæ*) characterised by the shape of the maxilla or upper jawbone which as shown in a previous paper (Vol. XVI., p. 535) consists of a vertical column bearing a pair of tubular fangs. In all other snakes the long axis of the maxilla is placed horizontally.

The fangs of vipers are relatively much longer than in poisonous colubrines. They are also more curved, and slender, and the seam on their anterior faces—which marks the junction of the circumflexed walls that form the poison canal—is far less obvious than in poisonous colubrines.

The family *Viperidæ* is divided into two subfamilies on the presence or absence of a cavity placed between the eye and the nostril, and known as the loreal pit. The pit bearers are called pit vipers, and are classed together under the name *Crotalinæ*, the pitless vipers under the name *Viperinæ*.

ANCISTRODON HIMALAYANUS.

This viper belongs to one of the four genera into which the subfamily Crotalinæ is divided. The genus is characterised by the possession of large shields of the colubrine type on the top of the head, and the absence of a rattle at the end of the tail. It contains eleven species, seven of which are American, three Asian, and one European.

History.—It was first described by Dr. Günther in 1864.

Nomenclature.—(*a*) *Scientific.*—The generic name from the Greek "agkistron" a hook, and "odous" a tooth was introduced by de Beauvois in 1799.

From the derivation, and the fact that the godfather of the genus spelt the name *agkistrodon*, it seems a pity that the word has been

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altered to its present rendering which was introduced by Baird in 1864.

(*b*) *English.*—The brown Himalayan viper is probably the best name for it. The only other brown viper in this mountainous region is *Lachesis monticola* which occurring only in the Eastern Himalayas, and extending to the Malayan subregion may be designated the brown, or spotted Himalo-Malayan viper.

(*c*) *Vernacular.*—The only native name I know for it is " pohur " which is what the Kashmiris call it.

General characters.—The body is rather stout, and heavy for the length of the snake, and round in section. Anteriorly it attenuates so as to make the neck very apparent, behind the broadly expanded angles of the jaws. Posteriorly it suddenly reduces in girth at the anus, so that the termination of the body, and commencement of the tail are far more obvious than in colubrine, and other snakes. The head is rather elongate and remarkably flat above, and especially so on the snout, this being due to the marked ridge (*canthus rostralis*) proceeding forwards from the eye-brow. The muzzle is rather narrow in front, the head broadest midway between the eyes and the neck. The nostril is rather small, and placed near the middle of a shield which is usually quite divided below, and frequently above the nasal aperture. The eye is rather large with an iris beautifully specked with gold, and a vertical pupil. The commissure of the mouth shows an exaggerated curve opposite the fang. The tail is about one-seventh the total length of the snake and ends in an elongate terminal shield. The scales on the upper parts are lustreless, and strongly ridged, the shields beneath smooth, and highly polished.

Identification.—It is a very easy snake to recognise. To begin with the association of a loreal pit, with large shields on the head proclaims the genus, and there are only three species within Indian limits, *viz.*, *himalayanus*, *hypnale*, and *millardi*. Both the last have a more or less well marked boss on the top of the snout—which is absent in the foremost—and inhabit Hills South of Bombay, or Ceylon.

Dimensions.—The largest measurement I know of is that recorded by Stoliczka, *viz.*, 34 inches. I have never seen one more than 25½ inches and I should say that average adults vary from about eighteen inches to two feet.

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Haunts.—The brown Himalayan viper favours an altitude between about 7,000 to 10,000 feet though it wanders higher. Within these limits it is a very common snake, perhaps the most common in the Western Himalayas, but East of Nepal is decidedly uncommon. Mr. G. A. Millar writing to me in 1900, told me that during a 13 years' residence in Darjeeling he had only once had this snake brought to him, though he was interested in the collection of snakes now preserved in the museum of St. Joseph's College, and did much to make it what it is. I know of no other authentic record of this viper from this part of the Himalayas (*i. e.*, East of Nepal). Above 10,000 feet the snake becomes increasingly scarcer with the altitude. I found it at about 12,000 feet in Kashmir, and a specimen in the Indian Museum was captured at the foot of the Dharmsala glacier at an elevation of 16,000 feet. This is by far the highest altitude I know of for any snake. The only other proximate elevations known to me are 14,000 feet where the snake discovered by Lieut. F. M. Bailey, inhabiting hot springs in Thibet was captured, which I described in this Journal as *Tropidonotus baileyi*, and 12,500 feet the elevation at which Dr. H. Gadow encountered a rattlesnake in Mexico (*Crotalus triseriatus*). I think it is essentially a forest lover, being rarely found away from the protection offered by vegetation. In Kashmir I had no difficulty in finding specimens whenever I instituted a search for them. It very frequently found refuge beneath fallen timbers, so that I had rarely to turn over more than half a dozen logs before flushing one, and I have found two beneath different parts of the same bole. Of course it finds abundant refuge in other situations such as clefts in rocks, or beneath boulders where it is more difficult to dislodge. In Kumaon it frequently takes up quarters in the walls of terraced fields, or gardens where it is a source of special danger to the inquisitive house dog, that will thrust its nose into any cranny where it has discerned a movement. In camp it is by no means an infrequent visitor to one's tent, a fact which places most people on their guard who know Kashmir, and indulge in the gipsy life which is so attractive in that State.

Habits.—I encountered many in Kashmir when not searching for them. On a warm summer's day it is frequently to be seen coiled up, and basking in lazy enjoyment in the sun. Usually it selects a spot within easy reach of cover, to which it withdraws in a leisurely

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fashion when disturbed. In cold or inclement weather it retires to any convenient quarter. Its movements are never what I would call really active, in fact compared with other non-viperine snakes it is a sluggard and it does not appear capable of hurrying itself under any amount of stimulation.

It probably passes a long term of hibernation each year, coming forth like other snakes of temperate climes in the spring and retiring in the late autumn. In spite of this it manages to fatten itself amply, for in the autumn months, its organs are packed with fat to a degree that has made me suspect a gravid condition, but subsequent investigation has frequently proved such a specimen a male. This snake in common with many other will often when provoked flatten itself, or crouch on the ground in a remarkable manner. The flattening is most evident in the hinder part of the body, but what object the snake has in behaving so it is difficult to guess at. Mr. Gleadow has remarked on this peculiarity in this Journal (Vol. xii, p. 577).

Disposition.—The brown Himalayan viper is a lethargic individual, slow to anger, but if sufficiently provoked will bite. It would appear to avoid a disagreeable situation whenever possible rather than provoke an encounter. The specimens I removed into the open and played with, would pass by a stick, or other offending object pushed in their way again and again as if unconscious of the offence offered. If rapped on the tail they shook that appendage with vigour in acknowledgment of the insult, without turning to avenge it. If cover was within easy reach they always strived to get there, rather than show fight, but if baulked, or if severely struck they would coil themselves up, erect the head, quiver the tongue and vibrate the tail tip, and on further provocation would frequently strike out fiercely. I think it probable that they rarely inflict a bite unless trodden upon.

Food.—Stoliczka* says that it feeds principally on mice, but although my observations were made for the most part in the same part of the Himalayas as his, I never found anything in the stomachs of those captured in Kashmir except the little skink *Lygosoma himalayanus*. This beautiful little lizard with its cherry-red waistcoat, is extremely common in Kashmir, where one rarely turns over a stone, without

* Jourl. As. Soc., Bengal, Vol. XXXIX., p. 226.

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finding one quartered in company with an equally common black scorpion. So many of my brown Himalayan vipers had recently fed on this lizard, that it is evident, that they must contribute largely to checking their numbers. I have found as many as three *Lygosoma* in the stomach of a single *Ancistrodon*. In other parts of the Himalayas I have usually found this same lizard taken, but in Kumaon I have on four occasions known mice devoured.

Breeding.—I do not know the exact mating season, but it is probably in the spring—April or May. The period of gestation is also not known. Like most other vipers this species is viviparous in habit, and the young are launched forth probably in August and September. Several specimens I had in July were gravid and contained immature embryos. These were seen to be coiled spirally, in a bath of transparent fluid, which occupied the upper part of the yolk. The investing membrane covering this oval shaped bath was transparent, so that the contained fœtus could be seen clearly in every detail, before the egg investment was ruptured. The embryos I unravelled in July were about two or three inches in length. What the length of the embryo at birth is I cannot exactly state, but it is probably about 5 inches. The species is not very prolific, only from 5 to 7 embryos having been observed in a single brood.

Poison.—Nothing is known about the qualities of the poison and I have never been able to hear of a casualty in the human subject, except that of a cooly employed by Mr. P. W. Mackinnon near Mussoorie who was scratched in the thumb when attempting to capture one. The fact that the injury sustained was very slight and superficial and no ill effects of any sort were evoked makes it fairly certain that no venom had been injected in this case. A dog bitten on the nose this year at Binsar (Kumaon) suffered considerably. The whole muzzle swelled, and the animal was very distressed and affected constitutionally. The wound was not incised, but permanganate of potash was applied locally. One may assume that this reagent had little if any effect in neutralising any poison injected below the surface skin. After one day's serious illness, the dog improved, and in two more days was quite well again. There were no hœmorrhages reported. I did not see the dog, but the snake was referred to me and I learnt the details of the casualty later.

It would seem from this case that the poison is not very virulent,

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and it is probable that in the human subject a fatality is unlikely to occur, but it seems strange that we should know so little about the effects of the bite of so common a snake. There must be abundant casualties every year in the Himalayas, but so long as people before whom these cases are brought, refrain from publishing details, and omit to refer the offender to some authority for identification, our ignorance of the poison effects will remain what it is.*

Distribution.—The Himalayas, probably as far as the Indus in the West and the Brahmaputra in the East. The Khasi Hills in Assam is also reported as a habitat, as far as I am aware on the sole authority of Jerdon. I think we should await confirmation of this before accepting it. It is a very easy matter for even the most careful collectors to mix specimens. In at least one instance, *viz.*, *Dinodon septentrionalis*, Jerdon was in doubt as to whether the locality was the Himalayas or Khasi Hills in Assam. I have also shown reason to doubt† the Himalayas as the habitat of the specimens of *Trachischium monticola* in the British Museum collected by Jerdon, this snake being otherwise only known from the Khasi and neighbouring Assam Hills, and it seems to me possible that in the case of *Ancistrodon himalayanus* Jerdon's specimens in the British Museum may have come from the Himalayas.

Lepidosis.—*Rostral.*—About as high as broad; in contact with six shields, the anterior nasal sutures being much the longest. *Internasals.*—A pair; the suture between them as long or nearly as long as that between the præfrontal fellows, as long or rather shorter than the internaso-præfrontal sutures. *Præfrontals.*—A pair; the suture between them subequal to the præfronto-frontal sutures; in contact with internasal, supraloreal, uppermost præocular, supraocular, and frontal. *Frontal.*—Touches six shields (exclusive of the small scales so often interpolated at the angles of the head shields); the fronto-supraocular sutures longest. *Supraoculars.*—Length and breadth subequal to that of the frontal. *Nasal.*—Usually incompletely divided by a suture from the nostril to first labial, which, however may be absent; sometimes an additional suture passes from the nostril to the internasal; in contact with the 1st only of the supralabial series. *Supraloreal.*—One, in contact with the internasal. *Loreal.*—

*This was written before Colonel Fenton's notes which appeared in our last Journ., p. 1004.
† Bomb. Nat. His. Journ., Vol. XIX., footnote, page 343.

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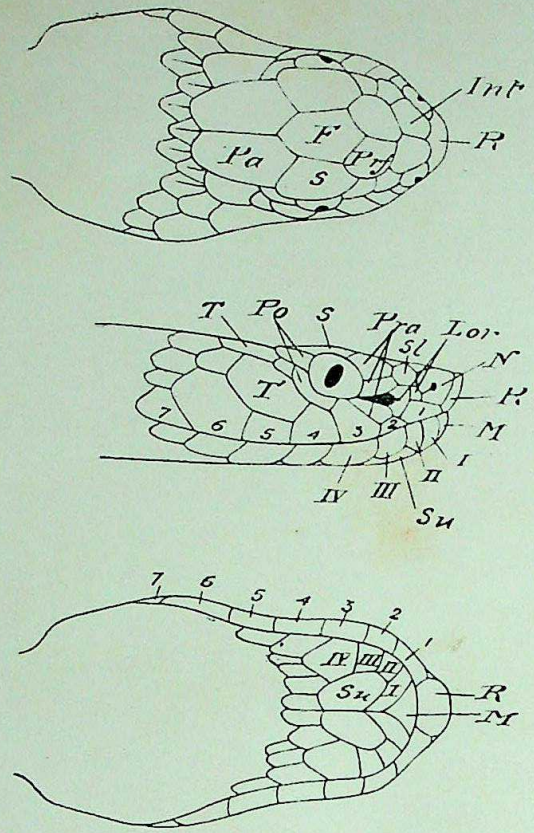
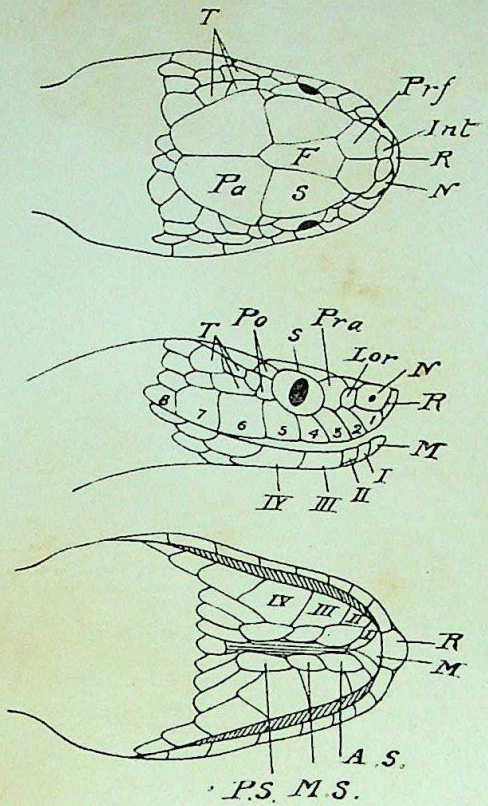


Ancistrodon himalayanus (× 2).



Psammodynastes pulverulentus (× 2).

The Common Snakes of India.

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A POPULAR TREATISE ON THE COMMON INDIAN SNAKES.

EXPLANATION OF DIAGRAM.

ANCISTRODON HIMALAYANUS and *PSAMMODYNASTES PULVERULENTUS.*

A. S.	Anterior Sublinguals.
F.	Frontal.
Int.	Internasals.
Lor.	Loreals.
M.	Mental.
M. S.	Median Sublinguals.
N.	Nasals.
Pa.	Parietals.
Po.	Postoculars.
Pra.	Præoculars.
Prf.	Præfrontals.
P. S.	Posterior Sublinguals.
R.	Rostral.
S.	Supraocular.
Sl.	Supraloreal.
Su.	Sublingual.
T.	Temporals.
I to 8	Supralabials.
I to IV	Infralabials.

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One deeply grooved, and forming the anterior boundary of the loreal pit. *Præoculars.*—Three, the two lowest diverging forwards, and forming the upper and lower boundaries of the loreal pit. *Postoculars.*—Usually two (sometimes three), the lower larger, and somewhat crescentic. *Temporals.*—Two, the lower very large and in contact with the 3rd, 4th and 5th supralabials normally (where the supralabials are 8, it touches the 4th, 5th and 6th). *Supralabials.*—Usually 7, the 2nd touching the eye (sometimes 8 with the 3rd touching the eye) ; the penultimate a very large and high shield. *Infralabials.*—Four, the 4th largest, and in contact with 3 or 4 scales behind. *Sublinguals.*—A single pair. *Costals.*—Two headslengths behind head, 21 usually (rarely 23), midbody 21 (rarely 23), two headslengths before the anus 17 ; all the rows strongly keeled except the last for a variable distance anteriorly ; apical facets present in pairs. *Ventrals.*—144 to 166. *Anal.*—Entire. *Subcaudals.*—34 to 52, divided.

Abnormalities.—Small scales are often intercalated between the head shields. Rarely some of the anterior subcaudals are entire. I have never seen a specimen with the scale rows 23 in midbody, but Boulenger mentions such.

Colour.—Very variable. Specimens occur of a nearly uniform light brown, of various tints to blackish-brown. Usually the snake is more or less conspicuously marked with a coarse mottling or blotching, darker than the ground colour, and irregularly distributed. Sometimes more or less obvious short crossbars are apparent, and very frequently a light vertebral line bordered with dark zigzag or sinuous stripes laterally. The flanks are beautifully dappled with various shades of dark brown, and there are often some white mottlings at the side of the neck. The head is often darker than the back, and shows dark marks on the enlarged shields. A conspicuous oblique dark streak bordered with white, runs from the eye to the gape. The lips are enamel-white or pale pink, and so is the chin and throat, and many of the labial sutures pigmented. The underparts are very finely powdered with various tones of brown, sepia, rufous, plumbeous or dirty white. The tail is usually reddish towards the tip.

Dentition and jaws—Maxilla.—Upper half hollowed out into a cup, the external and posterior walls of which are deficient. This cup to which the præfrontal bone provides a roof, forms a spherical chamber—the loreal pit. Below the bone supports two canaliculate fangs.

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Palatine.—Very short, about one quarter the pterygoid in length, highly compressed; not extending forwards as far as the maxillæ; a short edentulous space in front, and a longer space behind; supports 3 or 4 subequal well developed teeth. *Pterygoid.*—Highly compressed; from 6 to 9 subequal well developed teeth anteriorly; more than half its length edentulous behind. *Mandibular.*—Dentary bone about half the length of the articular; supports 11 teeth, gradually reducing in length behind.

The family *Colubridæ* according to the present accepted scheme of classification is divided into three large groups or "Series" based upon the absence, presence, and situation of grooved or tubular teeth (fangs). The *aglypha* (Greek "a" without and "glypho" I carve) are characterised by the absence of "carved" or grooved teeth. The *opisthoglypha* (Greek "opisthe" behind), has grooved fangs fixed in the posterior extremity of the maxilla or upper jaw, and the *proteroglypha* (Greek "proteros" before), has tubular fangs situated in the front of the maxilla. The fact that the fangs in the *opisthoglypha* are grooved, and those in the *proteroglypha* tubular has never yet been actually stated in works on ophiology, and in perusing the standard work on the subject, *viz.*, the Catalogue of the snakes in the British Museum by Mr. Boulenger one must of a necessity be misled, for the author repeatedly, if not invariably, speaks of grooved fangs in describing the dentition of the *proteroglypha*. As a matter of fact all the fangs in the snakes of this series are tubular, though there is always a very obvious seam on the anterior face of the fang where the circumflexed walls have united. The subject of this paper belongs to the opisthoglyphous series of colubrines, as will be seen on referring to the figure of the maxillary dentition. (See page 79).

This series is divided into three sub-families *Homalopsinæ*, *Dipsadomorphinæ* and *Elachistodontinæ*, the species of which are all harmless to men. *Psammodynastes* is one of the 69 genera into which the second of these sub-families is further divided.

PSAMMODYNASTES PULVERULENTUS.

The Mock Viper.

History.—This snake was first described by Boie in 1827, and for many years was classified as a *Psammophis*. In 1858 Günther

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removed it from this genus on account of its corporeal habit which is much shorter, and stouter than that characteristic of *Psammophis*, and introduced the present generic name. There is no doubt that the two genera are very distinct, for though the maxillary dentition is very similar in both, I notice that there is a short edentulous gap between the 4th tooth, and the succeeding enlarged pair in *Psammophis* which does not occur in *Psammodynastes*. Of much greater significance however are the differences in shape of the præmaxillary, nasal, and frontal bones especially the last. Further the palatine bone in *Psammophis* is unusually short, not extending as far as the 4th maxillary tooth whereas in *Psammodynastes* it extends forwards to the 2nd tooth.

The genus *Psammodynastes* has but two species, one peculiar to the Malayan sub-region, *viz.*, *pictus*, the other also a Malayan snake whose range of distribution extends through a considerable area of our Indian Dominions, *viz.*, *pulverulentus*.

Nomenclature—(*a*) *Scientific.*—The generic name is from the Greek "psammos" sand, and "dunastes" a ruler. The specific title is from the Latin, meaning dusty.

(*b*) *English.*—The mock viper seems to me the most appropriate name for it, for it bears a very marked superficial resemblance to a viper, a fact remarked upon by most previous writers. Its similarity to the Himalayan pit viper *Ancistrodon himalayanus* is especially striking, as will be seen from our Plate, and I know of no more remarkable resemblance between any two snakes of different families, or even genera. The short and rather stout body, contracted tail, flattened head, swollen lips, large eye with vertical pupil, lustreless dorsal scales, and highly polished ventral plates are all very characteristic viperine traits, but the resemblances do not stop here, for its attitude of menace is very like that of vipers, added to which it is viviparous in habit.

(*c*) *Vernacular.*—I know of none.

General characters.—The head is flattened on the top, and rather almond-shaped, the snout narrowed in front, and rather short, and the neck very obviously constricted. The ridge from the eye to the snout (*canthus rostralis*) is very marked, separating the face from the crown. The upper lip is rather swollen giving a forbidding expression to the facies. The nostril is placed in a single shield, and the eye which is large has a vertically elliptic pupil, and an iris specked with gold. The body is rather stout, and short, and markedly compressed.

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(Mr. Boulenger says it is cylindrical but this is a mistake.) The tail is short being about one-fifth to one-sixth the total length of the snake. The scales on the back are lustreless and smooth, those on the underparts highly polished.

Identification.—As far as I am aware it is the only Indian snake that has three pairs of sublingual shields, separated by a longitudinal furrow (the mental groove), but it will be wiser to take in conjunction with this the costal rows which are 19 in midbody. Another unusual feature in lepidosis that I should mention here is that the suture which the lower temporal makes with the penultimate supralabial is decidedly shorter than that made with the antepenultimate. In almost all other snakes where the temporal touches two supralabials the anterior suture is much shorter than the posterior.

Dimensions.—Adults usually range between about 1 foot 3, and 1 foot 9 inches. The largest specimen I have measured was a ♀ which was 2 feet and ¾ of an inch long.

Haunts.—It is eminently a forest lover. I have always met with it in jungle, or quite close to jungle, and its sombre colouration must offer it considerable protection in the gloom of such an environment. The area of its distribution is one remarkable for the abundance of its forests, and the dearth of anything approaching desert tracts, so that its scientific name "lord of the sands" is unfortunate. I have had several specimens sent to me from tea estates in the Eastern Himalayas and Assam where again there is abundance of cover and shade. Nicholson* mentions having taken one whilst swimming in the Rangoon lake. This was probably an accidental circumstance for it shows no special predilection for an aquatic environment, though like other land snakes it can evidently swim with ease when occasion demands it. It is a much commoner snake in the Hills than in the Plains, and favours especially altitudes between about 3,000 and 6,000 feet. In the Khasi Hills within these limits I found it quite a common snake, and in the Eastern Himalayas below Darjeeling I have had enough specimens sent me to show that it is to be considered one of the common snakes in this locality. Below 3,000 feet in the same vicinity it is decidedly less common, and Stoliczka† even records it as a rare snake there. It occurs in the

* Indian Snakes, p. 131. † Journal, Asiatic Society, Bengal, Vol. XL., p. 422.

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Plains in Upper Assam and in Burma, but I would call it, an uncommon species at this level. In Burma Evans and I only got 4 specimens out of a total of considerably over 600 nearly all of which were collected in the Plains. In Assam I got only 5 in the Plains out of a total of 615 specimens.

Habits.—Though a vertical pupil is usually associated with a nocturnal habit, this snake appears to me to be more frequently abroad in the day time than at night, in fact most of my specimens, if not all, have been encountered during the day. It is a lively little creature exhibiting much activity when disturbed, and I have usually found it difficult to capture for two reasons, firstly owing to the agility with which it disappears into cover which is always adjacent, and secondly owing to the caution necessary in dealing with a snake that cannot be distinguished from a viper with any degree of certainty till after capture. I have liberated specimens in the open, on a road or in my verandah and it makes strenuous efforts to escape, even indulging in a series of leaps in order to evade recapture.

A hatchling of 4¾ inches that I had in captivity managed to scale, and cling to the face of the glass bottle in which it was incarcerated, the diameter of its prison being about 4 inches, a truly marvellous feat showing that its scansorial powers are little if at all inferior to that of the deftest climbing snakes, but in nature I have never noticed any inclination for it to climb into bushes or trees.

Disposition.—The mock viper is a plucky, and vicious snake. Those I have met with have usually menaced if they have not actually struck at me. One I had in captivity for some time invariably prepared to strike at me, adopting a truly viperine pose with head erect and the forebody retracted into sigmoid curves. Those I have flushed in their native haunts have usually struck viciously at me, and more than one trustworthy informant who has sent me a live specimen appears to have met with a similar experience. Blanford* mentions encountering one in Sikkim that nearly bit him. Even the little hatchling I had in captivity struck out fiercely at me. On the other hand I have had two specimens that refused to strike under severe provocation, though they posed as if intending to do so.

Food.—Its staple diet is of a reptilian order, frogs and lizards being equally favoured. On four occasions I have found frogs in the

* Journal, Asiatic Society, Bengal, 1871, p. 373.

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stomach, once in a diminutive specimen only 7½ inches long. The lizards I have known taken are *Ptyctolæma gularis* once, a *Calotes* once in Shillong which was almost for certain *jerdoni* as the scales were of a vivid green colour, and skinks of the genus *Lygosoma* on three occasions, two of these being *L. indica*.

The sexes.—My notes show that the sexes are evenly balanced, and with the exception of one unusually large ♀ my measurements seem to indicate a similar degree of growth between them. Males as a rule have rather longer tails.

Breeding.—I have had opportunities of chronicling but few breeding events, so that I cannot speak with any great certainty of this important function. In the hills the mating season would appear to be in summer, probably about August since I have had two specimens with impregnated ovarian follicles in September in the Khasi Hills (Shillong) and one in the same month in the Eastern Himalayas (Pashok). As regards the Plains I can vaguely suggest that matrimonial intercourse probably occurs in the winter months—December to February—at least so it would appear. The period of gestation is not known, but probably exceeds four months, since the young are discharged alive. The gravid ♀ I kept in Dibrugarh appeared obviously in this state two months before I killed her and eviscerated her unborn progeny. In the Plains the young are born in June and July, for I captured a hatchling 4¾ inches long in Rangoon in June and the almost mature embryos of my captive Dibrugarh specimen just alluded to were expected in July.

The young at birth measure from about 4¾ to 5¼ inches. The species is not very prolific from an ophidian standpoint. I have on two occasions found 10 eggs in the oviducts, once 8, and in my Dibrugarh specimen there were 3 embryos, and 3 non-fertile eggs.

The rate of growth is somewhat difficult to calculate from my records, but it appears to me that the young double their length in the first year, add some 4 to 6 inches in the second, and at the beginning of their third year appear to be sexually mature since my smallest gravid ♀ measured 1 foot 3¾ inches. These deductions are in consonance with my observations on other snakes.

Distribution.—The Eastern Himalayas probably as far West as the Western limit of Nepal, the Assam Hills and Plains, the Burmese

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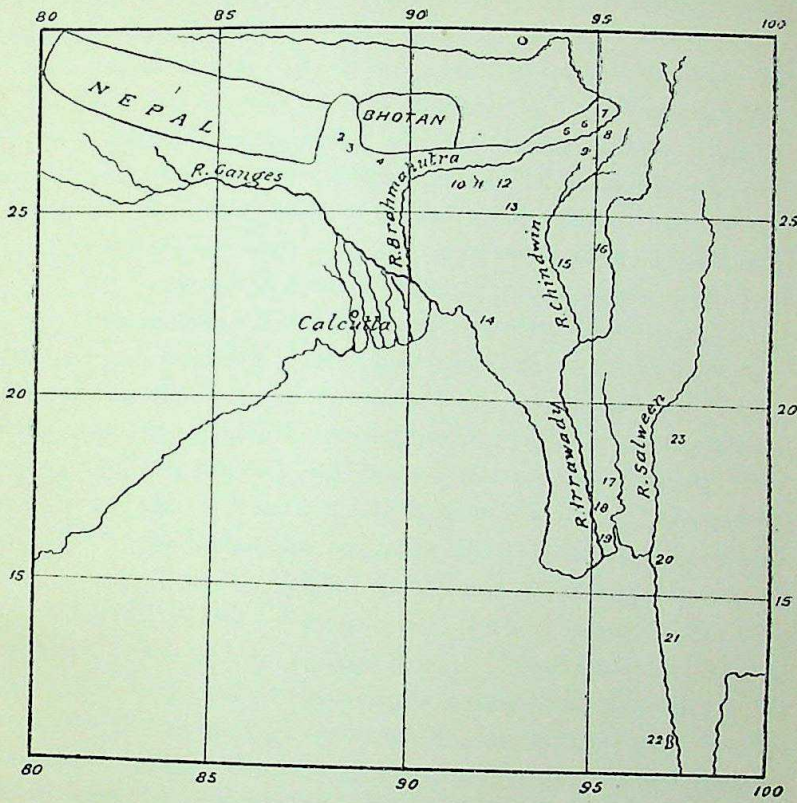

DISTRIBUTION OF *Psammodynastes pulverulentus* WITHIN INDIAN LIMITS.

1. Butal, Nepal (I.M.). 2 Pashok (F.W.). 3 Tindharia (F.W.). 4 Buxa Dooars (F.W.). 5 Dejao, N. Lakhimpur (F.W.). 6 Dibrugarh (F.W.). 7 Sadiya (F.W.). 8 Jaipur (F.W.). 9 Sibsagar (I.M.). 10 Shillong (F.W.). 11 Cherrapunji (I.M.). 12 Samaguting (I.M.). 13 N. Cachar (I.M.). 14 Chittagong (I.M.). 15 Kindat (F.W.). 16 Katha (F.W.). 17 Wumbezat (Wall and Evans). 18 Pegu (I.M. and Theobold). 19 Rangoon (Nicholson, Wall and Evans). 20 Moulmein (I.M. and F.W.). 21 Tavoy (I.M.). 22 King's Isle, Mergui (I.M.). 23 Tounggyi, S. Shan States (B.M.).

I.M. implies Indian Museum, B.M. British Museum, and F.W. the Writer.

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Hills and Plains, Indo-China, Tenasserim, the Malay Peninsula, and the whole Malayan Archipelago to Formosa.

The precise localities from which it has been collected within Indian limits are shewn in the accompanying map.

In the Indian Museum there is a specimen said to be from the Central Provinces of India, but as this seems to me most unlikely it is best to await confirmation of this locality, which is so far removed from its certain area of distribution, before accepting it.

Lepidosis.—Rostral.—Touches 6 shields, the rostro-nasal sutures longest. *Internasals.*—Two, the suture between them $\frac{2}{3}$ to $\frac{3}{4}$ that between the præfrontal fellows, about $\frac{3}{4}$ the internaso-præfrontal suture. *Præfrontals.*—Two, the suture between them equal to or rather greater than the præfronto-frontal suture; in contact with internasal, nasal, loreal, upper præocular, supraocular, and frontal. *Frontal.*—Touches 6 shields, the supraocular suture about three times the length of the parietals, and more than twice that of the præfrontals. *Supraoculars.*—Length subequal to frontal, breadth about twice that of the frontal along an imaginary line connecting the centres of the eyes. *Nasals.*—Single; in contact with the 1st only of the supralabial series. *Loreal.*—One, rather longer than high. *Præoculars.*—One or two (rarely three). *Postocular.*—Two (rarely three). *Temporals.*—Two anterior, in contact with the 6th and 7th supralabials, making a longer suture with the 6th than with the 7th. *Supralabials.*—Eight, the 3rd, 4th and 5th touching the eye; the 6th and 7th subequal, and largest. *Infralabials.*—Four, the 4th largest and in contact with two scales behind; the first three touch the anterior and the 4th only the posterior sublinguals. *Sublinguals.*—Three pairs. *Costals.*—Two headslengths behind the head 17, midbody 17, two headslengths before the anus 15; the row absorbed is the 4th above the ventrals; no keels; no apical pits. Ventrals 146 to 175. *Anal.*—entire. *Subcaudals.*—45 to 68 divided.

Colour.—Theobald speaking of this snake says: "This species is somewhat variable in colour and markings." I would go further, and say it is very variable, as much so as any snake I know. Some specimens are extremely dark, almost black, others very light, the prevailing hue being a pale ochraceous, but these extremes cannot be considered colour varieties for they are completely connected by transitional forms. Moreover one of the embryos I extracted from

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my gravid ♀ was of the light type and the two others of the dark. It must not be understood that in either case the snake is uniformly coloured for this is not so. It is always more or less obviously finely speckled or streaked with hues darker than the ground colour. There is very usually a series of large, oval, rufous or brown spots on each side of the spine, most noticeable anteriorly, and specially in the dark specimens. Sometimes these spots are confluent to form crossbars over the back. In many specimens there is a more or less distinct dark longitudinal band on the back involving the median five rows and half the sixth row above the ventrals, and a similar dark band in the flanks involving the lower half of the fourth, the third and the second, and upper half of the ultimate row. The flanks are often ornamented with white streaks anteriorly which are more or less hidden until the reptile dilates itself, and below these is usually a series of bright ochraceous, yellow streaks or spots, sometimes confluent into a band which are very conspicuous and ornamental. The head is usually streaked longitudinally on the top, and the upper lip is adorned with a white, black-edged mystaceous band. The belly is whitish or yellowish streaked, and finely specked with bright ochraceous-yellow anteriorly and with darker shades of brown further back.

Abnormalities.—I have seen the 1st supralabial divided into two superimposed parts once, and a similar condition of the loreal twice. Three præ and three postoculars less rarely occur. Boulenger says the scale rows are rarely 19.

Dentition.—Maxillary.*—The first 3 (rarely 2) teeth are small but progressively increase in size, and are succeeded without any edentulous gap by two large subequal fang-like, but solid teeth fully twice as long as any of the preceding. Behind these is a short toothless gap, and then a series of 5 (rarely 6) small subequal

* Boulenger's description "Maxillary teeth 9 to 11, third or third and fourth much enlarged fang-like, followed by a short interspace, last enlarged and grooved, anterior mandibular teeth strongly enlarged" is not very accurate, and it is therefore not surprising that as recently as 1905, the snake was redescribed by Mr. Rosen (Ann. and Mag. Nat. Hist. Vol. 15, p. 176), as the type of a new genus under the name *Anisodon lilljeborgi*. It will be seen however that the characters of the dentition as shown by him, prefectly agree with that given by me from my three skulls, and Mr. Boulenger's remarks on Mr. Rosen's paper above alluded to showing that *A. lilljeborgi* is in reality *P. pulverulentus* are undoubtedly correct.

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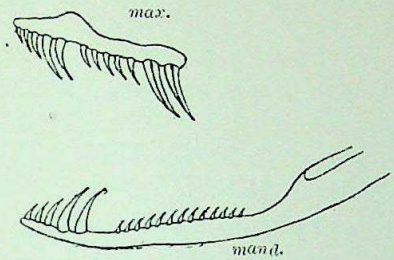
teeth followed by two large, subequal grooved fangs fully twice as long as the immediately preceding teeth.



Maxilla and mandible of *Psam : pulverulentus* (×3.)

Palatine.—8 to 11 small and subequal.

Pterygoid.—21 to 23 small and subequal.

Mandibular.—The first 2 or 3 teeth are small, progressively increasing in size, and succeeded without any gap by two large, subequal teeth fully twice as large as any of the preceding. Behind these is a short edentulous gap, followed by a series of from 13 to 15 small, subequal teeth.

(*To be continued.*)

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ON THE NOMENCLATURE OF THE INDIAN HEDGEHOGS.

BY

R. C. WROUGHTON, F.Z.S.

Recently in naming some hedgehogs presented to the National Collection, by Major Dunn, R.A.M.C., from Multan, I had occasion to go through the whole of the material available for examination in the Collection of the Natural History Museum, South Kensington. This material is far too incomplete to admit of any revision of the Genus. My study of the literature, however, has shown many points on which the nomenclature adopted by Blanford in his Fauna requires correction, and these I think it well to place on record.

First, however, I would call the attention of members to a few points on which information is specially required.

Two species (*spatangus* and *grayi*) were described by Bennett from the "Himalayas" in 1832, and in 1843 Gray founded *mentalis* on a specimen from the same locality. In the latter case there is reason to believe that the label-locality was wrong; was it so also in the former case? Is any species of hedgehog found in the Himalayas?

Two species of hedgehog, with the middle upper existing premolar (the 5th tooth from the back, the 6th from the front) showing a tendency to disappear, are found one in the north (Kach, Rajputana and Lower Sind), the other in the south (Madras). Is it a fact that in the southern species the zygomatic arch is *always* imperfect?

Is no species of hedgehog found in the Dekhan, *i. e.*, between Rajputana and the Madras Presidency? *

What exactly is *E. collaris*? Specimens of varying ages from the type locality, *i. e.*, Doab (this apparently means the area between the rivers Jumna and Ganges) can alone satisfactorily settle this question.

The following are the corrections in the nomenclature of Blanford's "Mammalia" which seem to be required.

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* It is hoped that members will respond to Mr. Wroughton's appeal and send specimens of Hedgehogs to our Museum. Hedgehogs may be easily captured alive and probably a small reward offered to cultivators for live specimens would result in many being obtained. They can then be forwarded alive and this Society would convert them into specimens thus saving members the trouble of skinning them.—EDS.

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"104. ERINACEUS COLLARIS"—

Type—A coloured plate without description.

Date—1830.

Locality—Doab.

Synonymy.—Royle, (Ill. Ind. Zool.) in 1839, gave the name of *indicus* to the Delhi Hedgehog but without description. Bennett in 1832 described *spatangus* and *grayi* from the "Himalayas" (Types B. M. Nos. 55, 12, 24, 34, and 55, 12, 24, 82). It must be left till further material is available for examination to decide whether these names should remain, as Blanford has placed them as synonyms of *collaris*. The name *blanfordi* must be removed from the synonymy of *collaris* for reasons given below under *jerdoni*.

"105. ERINACEUS MEGALOTIS"—

Types—B. M. Nos. 79, 11, 21, 515 and 516 (skulls only).

Date—1845.

Locality—Kandahar.

A well marked species, easily recognizable by its pale head and throat and dark underparts.

"106. ERINACEUS JERDONI"—

Co-Type—B. M. Nos. 87, 4, 2, 1.

Date—1878.

Locality—Rohri, Sind.

This name must give place to *blanfordi*, which was described at the same time, but on an earlier page. Anderson stated that the type of *blanfordi* (B.M. Nos. 87, 4, 2, 2) also from Rohri, Sind, had no bald area on the crown, this was an error. Comparison of the types shows that they are one species and *blanfordi* as the older name must be used, with *jerdoni* as a synonym.

"ERINACEUS MACRACANTHUS"—

Co-Type—B.M. Nos. 74, 11, 21, 25.

Date—1876 (East Persia by Blanford, p. 27).

Locality—S. E. Persia.

A large species, with a bald area running backwards over the crown of the head, as in *blanfordi*; spines long, with four alternate, dusky and white rings, 5mm. broad, and a long (10mm.) black point. Colouring somewhat in *megalotis* but the pale area extending backwards at least on to the chest. Hindfoot about 40mm. Blanford

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records it from Beluchistan and the Natural History Museum has a specimen collected at Kandahar by Colonel Swinhoe in 1881.

"107. ERINACEUS PICTUS"—

Type—?

Date—1872.

Locality—Kach.

This name must give place to *micropus*, which was described by Blyth in 1846 on a specimen (B.M. Nos. 79, 11, 21, 517, skull only) collected by Capt. Hutton at Bhawalpur. The zygomatic arch is complete. The name *micropus*, therefore, must stand for this species, with *pictus* as a synonym.

Synonymy.—In 1843 Gray in his Catalogue named a specimen, labelled "Himalaya" (B. M. Nos. 42, 4, 12, 16) purchased from a dealer, *mentalis*, but gave no description. There seems great probability, however, that the specimen was from Nasirabad.

"108. ERINACEUS MICROPUS"—

As *micropus* applies to a northern form, it cannot be used for the Madras Hedgehog, which was described by Horsfield in 1851 on a specimen (B.M. Nos. 79, 11, 21, 467) collected by Sir Walter Elliot under the name of *nudiventris*. This latter name must therefore stand for this "South-Indian Hedgehog."

Thus corrected, the list of the Indian Hedgehogs is as follows :—

1. *Erinaceus collaris*, Gray and Hardwicke
   = *indicus*, Royle (nomen nudum)
   = *spatangus* et *grayi*, Bennett.
2. *Erinaceus megalotis*, Blyth.
3. *Erinaceus blanfordi*, Anderson
   = *jerdoni*, Anderson.
4. *Erinaceus macracanthus*, Blanford.
5. *Erinaceus micropus*, Blyth
   = *pictus*, Stoliezka
   = *mentalis*, Gray (nomen nudum).
6. *Erinaceus nudiventris*, Horsfield.

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THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN "THE FAUNA OF BRITISH INDIA." SERIES IV, PART I.

By

Sir George F. Hampson, Bart., F.Z.S., F.E.S.

(*With Plates F. and G.*)

Bombycidæ.

THE MOTHS OF INDIA.

Plates F. and G., referred to in this paper, will appear in a subsequent number.

Eds.

Larva.—Draws in its head when alarmed nearly to a level with its shoulders, its body wide and flattened at the shoulders, narrowing and cylindrical at extremity, the anterior segments protrusible ; a horn on anal segment ; 16 feet, naked, leathery brown, darker on dorsum with a dark olive spade-shaped patch towards extremity ; lateral patches of yellow, the whole body dotted with green ; five small grey patches dotted with black on back, two yellow lines on the neck and two yellow spots on the spade-shaped patch ; the ventral surface with a yellow patch on each segment, legs pink ; prolegs with bright yellow dot on outer side. Food plant : *Camellia caudata*.

Cocoon.—Strong, silky, dull brown, pointed at one end and truncate at the other (Badgley).

47*a*. Andraca albilunata, n. sp. (Plate F., f. 2).

Forewing with the termen strongly excised below apex, angled outwards at vein 4, then strongly crenulate ; hindwing with the termen slightly excised below apex and strongly crenulate from vein 4 to tornus, the inner margin not excised.

Head, thorax and abdomen dark red-brown mixed with grey, the tarsi with the

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records it from Beluchistan and the Natural History Museum has a specimen collected at Kandahar by Colonel Swinhoe in 1881.

"107. ERINACEUS PICTUS"—

Type—?

Date—1872.

Locality—Kach.

This name must give place to *micropus*, which was described by Blyth in 1846 on a specimen (B.M. Nos. 79, 11, 21, 517, skull only) collected by Capt. Hutton at Bhawalpur. The zygomatic arch is

1. [illegible]
   = *indicus*, Royle (nomen nudum)
   = *spatangus* et *grayi*, Bennett.
2. *Erinaceus megalotis*, Blyth.
3. *Erinaceus blanfordi*, Anderson
   = *jerdoni*, Anderson.
4. *Erinaceus macracanthus*, Blanford.
5. *Erinaceus micropus*, Blyth
   = *pictus*, Stoliezka
   = *mentalis*, Gray (nomen nudum).
6. *Erinaceus nudiventris*, Horsfield.

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By

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(*With Plates F. and G.*)

Bombycidæ.

The genera *Bombyx* and *Mustilia* have the frenulum aborted and minute, the other genera have it fully developed.

41. Gunda *Sikkima* insert, No. 43, *Bombyx* lugubris which has precedence.

45*a*. Mustilia phæopera, n. sp. (Plate F., f. 1).

Head, thorax and abdomen rufous, the shaft of antennæ and a band between their basis white. Forewing rufous with a greyish tinge, the apical area from middle of costa to termen at vein 3 chocolate brown tinged with grey towards costa; antemedial line brown, excurved below costa and oblique below submedian fold; a rather diffused medial line excurved in cell and below submedian fold; postmedial line excurved below costa, then waved, incurved to vein 2, then excurved; cilia pale yellow. Hindwing pale greyish rufous, the terminal area broadly chocolate brown from vein 6 to tornus; two oblique minutely waved lines from middle of costa to tornus; cilia pale yellow; the underside greyish with the costal area suffused with rufous; two obliquely curved postmedial brown lines.

Habitat.—Assam, Khásis (Badgley). *Exp.* ♂ 54, ♀ 70 mill. Type in B. M.

Larva.—Draws in its head when alarmed nearly to a level with its shoulders, its body wide and flattened at the shoulders, narrowing and cylindrical at extremity, the anterior segments protrusible; a horn on anal segment; 16 feet, naked, leathery brown, darker on dorsum with a dark olive spade-shaped patch towards extremity; lateral patches of yellow, the whole body dotted with green; five small grey patches dotted with black on back, two yellow lines on the neck and two yellow spots on the spade-shaped patch: the ventral surface with a yellow patch on each segment, legs pink; prolegs with bright yellow dot on outer side. Food plant: *Camellia caudata*.

Cocoon.—Strong, silky, dull brown, pointed at one end and truncate at the other (Badgley).

47*a*. Andraca albilunata, n. sp. (Plate F., f. 2).

Forewing with the termen strongly excised below apex, angled outwards at vein 4, then strongly crenulate; hindwing with the termen slightly excised below apex and strongly crenulate from vein 4 to tornus, the inner margin not excised.

Head, thorax and abdomen dark red-brown mixed with grey, the tarsi with the

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terminal joint blackish. Forewing dark red-brown mixed with grey ; a deeper red-brown antemedial band defined by greyish on inner side and with slightly waved edges, oblique from costa to submedian fold ; an indistinct brown discoidal bar with grey line in centre ; a waved brownish medial line and waved grey postmedial line with somewhat deeper brown band between them ; small obliquely placed subapical white lunules below veins 7 and 6 with a reddish tinge beyond them. Hindwing red-brown with a greyish tinge , a small brown discoidal spot and chocolate brown spots on inner margin before and beyond middle with greyish marks beyond them ; cilia with whitish tips in the indentations, underside of forewing chocolate brown, the costa grey to postmedial line with brown spot beyond middle ; hindwing grey with brown discoidal spot, two waved brown postmedial lines with the area between them tinged with red-brown and a diffused red-brown patch at tornus.

Habitat.—ASSAM, Khásis (Badgley). *Exp.* ♂40, ♀46 mill. Type in B. M.

Larva.—Turns its head down and humps its shoulders in repose ; gregarious, long, cylindrical ; pairs of horns on 3rd and 5th somites and a single horn on anal somite ; 16 feet ; pubescent ; dull black dusted with grey ; dorsal line pale yellow ; subdorsal and lateral lines orange; two ventral yellow lines; broad yellow patches between the prolegs ; head black ; horns dusky with orange bases and whitish at tips. Food plant : *Cudranus javanicus.*

Cocoon.—Strong, silky, blunt in front, pointed behind with long ligaments at each end and a hollowed out boat-shaped projection on dorsum (Badgley).

EUPTEROTIDÆ.

65*a*. APONA KHASIANA, Swinh., A. M. N. H. (7), xx, p. 75 (1907).

Head, thorax and abdomen rufous ; antennæ with the shaft white, the branches brown. Forewing pale rufous, the basal area, the area beyond the medial line and the terminal area rather deeper rufous ; an obliquely curved antemedial line with a faint line beyond it, somewhat angled outwards below costa and bent outwards below submedian fold a black discoidal point ; a nearly straight and somewhat oblique medial line followed by a waved line; two waved postmedial lines ; an incurved subterminal line followed by an indistinct line with greyish patches beyond it at apex and middle, excurved to vein 6, incurved at middle, then waved. Hindwing pale rufous, the basal inner area and terminal area rather deeper rufous ; a diffused oblique rufous antemedial band, two oblique waved medial lines and a minutely waved postmedial line ; the underside with the lines more distinct, the antemedial line double, three waved lines on medial area, the postmedial line excurved to vein 5 and with maculate band beyond it except at middle.

Habitat.—ASSAM, Khásis. *Exp.* ♂ 98, ♀ 110 mill.

70. EUPTEROTE MOLLIFERA., insert (syn.) *Eupterote pulchra;* Swinh., A. M. N. H. (7), XVIII, p. 404 (1906).

86*a*. SANGATISSA ARCTIADES, n. sp. (Plate F., f. 30).

Antennæ of both sexes bipectinate with moderate branches.

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Head and thorax fulvous ; antennæ with the shaft whitish, the branches brown ; pectus, legs, and abdomen greyish tinged with fulvous. Forewing pale cinnamon brown, the veins, discal and submedian folds streaked with white. Hindwing white tinged with brown, thinly scaled.

Habitat.—ASSAM, Khásis (Badgley). *Exp.* 36-46 mill. Type in B. M.

Larva.—Feeds at night and rests during day in a company on underside of leaf, the head and tail curved under in repose ; cylindrical ; hair soft, thick with scattered long hairs; dull brown with the long hairs grey ; ventral surface dull red ; head black. Food plant : *Vitisadnata.*

Cocoon.—Silken mixed with hairs, slight, oval, in a cluster, grey-brown.

Pupa.—Short, blunt at both ends, a tuft of fine hooks at tail by which it is fastened to cocoon ; shining bright brown. (Badgley).

SPHINGIDÆ.

ACHERONTIANÆ.

Genus PENTATEUCHA.

Type.

Pentateucha, Swinh., A. M. N. H. (8), 1, p. 61 (1908)..... *curiosa.*

Proboscis fully developed ; palpi upturned, slender, reaching about to middle of frons, the 2nd joint fringed with long hair in front, the 3rd short ; frons with tuft of hair ; antennæ of female ciliated ; thorax clothed with long rough spatulate hair ; tibiæ fringed with long hair, the hind tibiæ with two pairs of spurs, the fore tarsi with three large curved claws on 1st joint ; abdomen clothed with long rough hair ; frenulum present. Forewing with the apex rounded, the termen evenly curved, crenulate, vein 3 from well before angle of cell ; 5 from middle of discocellulars ; 6 from upper angle ; 7, 8, 9 stalked ; 10, 11 from cell. Hindwing with vein 3 from well before angle of cell ; 5 from well above angle ; 6, 7 from upper angle ; 8 approximated to 7 beyond the cell.

171*a*. PENTATEUCHA CURIOSA, Swinh., A. M. N. H. (8), 1, p. 62 (1908) (Plate F., f. 18).

♀. Head and thorax clothed with deep red-brown hair tipped with white ; pectus and legs rufous, the tarsi blackish ; abdomen blackish mixed with grey-white forming obscure segmental bands, the anal tuft and ventral surface rufous. Forewing clothed with dark red-brown hairy scales mixed with white, some rufous at base of inner area ; faint traces of a dark antemedial line ; an oblique elliptical white discoidal spot ; postmedial line with oblique dark bar from costa, then very indistinct, excurved to vein 3, then incurved ; subterminal line indistinct, double, oblique, waved, bent inwards to costa, where there is a white mark on it, a dentate line beyond it arising from apex, white and prominent from apex to vein 6, then indistinct and forming white points on the veins ; cilia rufous with whitish points at the veins. Hindwing bright rufous, the inner area whitish to near tornus, where there is a dark patch with whitish bar beyond it ; an indistinct diffused pale postmedial line ; cilia with some white scales at tips. Underside of both wings, rufous ; forewing with indistinct pale discoidal spot, obliquely curved postmedial band and

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prominent dentate white band from apex to above vein 6 ; hindwing suffused with white to beyond middle and tornus, an oblique slightly waved medial rufous line and indistinct postmedial line bent outwards to just above tornus, the terminal area irrorated with whitish.

Habitat.—ASSAM, Khasis. *Exp.* 104 mill.

AMBULICINÆ.

91*d*. MARUMBA MICROTA, Hmpsn., Nov. Zool, xiv., p. 327 (1907). (Plate F., f. 11).

Fore tibia with long curved claw at extremity.

♂. Head and thorax red-brown, the head rather paler, except the palpi ; antennæ whitish ; abdomen red-brown. Forewing grey-brown suffused with purplish rufous and with slight dark irroration ; a black and rufous subbasal spot on vein 1 ; an oblique brown medial line diffused on outer side ; postmedial area somewhat greyer ; an indistinct slightly curved subterminal line with two conjoined red-brown spots on it at inner margin ; a small dark brown spot on termen below apex defined by a grey lunule on inner side and with a very indistinct triangular brown shade below it from termen to the subterminal line ; cilia dark brown. Hindwing purplish red-brown with indistinct darker shade on termen near tornus ; cilia dark brown with slight whitish tips towards tornus ; the underside rather redder with indistinct medial line and curved postmedial line.

Habitat.—MADRAS, Godavery District ; CEYLON, Kandy. *Exp.* 44 mill.

91*e*. MARUMBA POLIOTIS, Hmpsn., Nov. Zool., xiv., p. 327 (1907). (Plate F., f. 23).

Fore tibia with large curved claw at extremity.

♂. Head and thorax grey white, the head and tegulæ tinged with rufous ; metathorax with two slight tufts of blackish scales ; tarsi ringed with black ; abdomen grey-white dorsally suffused with rufous except at base and with fine black dorsal line expanding into a small spot on penultimate segment. Forewing grey suffused with reddish brown and irrorated with black, the basal and terminal areas browner and the postmedial area whiter ; some blackish suffusion before the whitish antemedial line which is defined by blackish on outer side, oblique from costa to median nervure, angled inwards in submedian fold, then excurved and angled inwards to inner margin ; a dark medial line excurved from costa to median nervure, then incurved to near antemedial line; a small pale rufous discoidal spot, slightly defined by blackish ; postmedial line dark, excurved from costa to vein 5, then incurved and sinuous ; subterminal line indistinctly double, excurved below costa, then oblique, dentate and with small somewhat dentate black marks on its outer edge, the mark below costa extending as a streak to termen and the mark at vein 4 larger ; slight black marks on termen at the extremities of the veins. Hindwing grey suffused with brown ; postmedial line excurved and indistinct from costa to vein 4, then incurved and with whitish patch beyond it in submedian interspace, ending at tornus ; the underside whitish irrorated with fuscous, the

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postmedial line fine, a curved dentate subterminal line with slight brownish band beyond it becoming terminal below vein 4.

Habitat.—GANJAM. *Exp.* 54 mill.

MACROGLOSSINÆ.

118*b*. AMPELOPHAGA OBLIQUIFASCIA, n. sp. (Plate F., f. 13).

♀. Head and thorax grey slightly mixed with red-brown, the vertex of head and dorsum of thorax red-brown ; palpi with white line on 1st joint at side, the 2nd joint red-brown at side ; pectus ventrally orange-red ; tibiæ and tarsi grey-white ; abdomen grey with broad diffused dorsal deep red-brown bands, the ventral surface fiery red with segmental brown lines. Forewing purplish grey tinged in parts with red-brown ; subbasal diffused red-brown marks in cell and on vein 1 ; three rather indistinct and diffused curved waved antemedial brown lines ; a slight discoidal point ; a rather broad black-brown band from middle of costa to termen at vein 4, expanding somewhat at costa and into a large triangular patch on termen extending almost to tornus ; postmedial line slight and dentate from costa to the oblique band, then oblique more strongly dentate with some fulvous yellow on its outer side, with a waved line before it from vein 2 to inner margin and two waved lines beyond it from the band to inner margin ; subterminal line double, brownish and slightly waved from costa to vein 5, indistinct except toward costa where it is filled in with yellowish ; a wedge-shaped brown mark on termen below apex ; cilia black-brown. Hindwing dark-brown tinged with red, the inner area greyish ; cilia rufous, whitish at tips. Underside of forewing fiery red with the termen grey, some dark brown suffusion in and below cell, six indistinct waved lines on postmedial area, a pale yellow subapical lunule and two wedge-shaped postmedial marks below veins 3 and 2 ; hindwing fiery red, the inner area greyish, the terminal area brownish, three indistinct minutely waved red postmedial lines.

Habitat.—ASSAM, Khásis (Badgley). *Exp.* 80 mill. Type in B.M.

Larva.—Tapering to head, the thoracic somites very protrusible ; head small ; green with pale dots ; subdorsal line white shading off to oblique yellow lateral stripes tinged with pink above ; spiracles small, pale brown ; horn brown ; purple ; feet maroon with a yellow mark above each. Pupates in leaves spun together.

Pupa.—Long with two horns on head and three at tail, the posterior third of tail much smaller than the anterior part which forms a prominent ring ; dark brown with paler marks (Badgley).

Genus LEPCHINA.

Type.

Lepchina, Oberth. Bull. Soc. Ent. Fr., 1904, p. 76.... .....*tridens.*

Differs from *Acosmeryx* in the eyes being small, overhung by lashes; the terminal segment of antennæ not filiform ; the tibial spines shorter ; the 1st segment of mid-tarsi without elongate spines. Forewing with the termen

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produced to points at and below apex and excurved at middle. Hindwing with the termen sinuous.

116*a*. LEPCHINA TRIDENS, Obuth. Bull. Soc. Ent. Fr. 1904, p. 76.

♂. Head and thorax violaceous grey ; abdomen brown ; ventral surface reddish. Forewing violaceous grey with velvety brown lines and patches; the basal area with three lines followed by a postmedial triangular patch touching a discoidal point with its inner edge and extending from costa to termen and inner margin ; the apical area with some streaks and marks. Hindwing brown with darker medial and terminal shades. Underside ferruginous red ; forewing with the basal half blackish, two greyish costal patches, a sinuous terminal violet grey patch on both wings with medial whitish mark on forewing ; two double brown lines on hindwing with greyish costal patch beyond them.

Habitat.—SIKKIM. *Exp.* about 64 mill. This species is unknown to me.

181. MACROGLOSSA GYRANS.

Larva.—Velvety black with green and pink lateral stripes faintly striated with black ; spiracular stripe interrupted, similar in colour ; the spiracles pink with white centres ; head glabrous, green or pale red ; thoracic plate horny ; horn black.

Pupa.—Ochreous with black spots at sides. 5. (W. H. Campbell.)

198. MACROGLOSSA RECTIFASCIA.

Larva.—Pale yellow with faint blue transverse lines ; dorsal line very dark blue edged with pale blue from 3rd to anal somite ; lateral line similar, arising from two large black spots on 2nd somite and terminating just before two large black spots on anal somite ; below this is a series of black specks; a broad sublateral black band spotted with pale blue ; head prominent, dull green ; legs black ; claspers spotted with black ; horn pale blue with a black ring at base. Food plant : *Photinia Lindleyana*. 5. (W. H. Campbell.)

PERGESINÆ.

137*e*. RHAGASTIS LEUCOCRASPIS, n. sp. (Plate F., f. 25).

♀. Head grey ; palpi whitish at sides ; tegulæ and patagia chocolate brown with grey-white stripe on outer edge ; vertex of thorax grey-brown ; pectus and legs pale grey tinged with rufous ; abdomen with the 1st three segments chocolate brown, the rest of dorsum greyish tinged with fulvous, the sides whitish, the ventral surface tinged with rufous. Forewing purplish grey suffused in parts with rufous ; a subbasal rufous shade on costal area, the base of inner margin chocolate brown ; two obliquely curved antemedial brown lines, widely separated at costa, approximated at vein 1 where they terminate ; an oblique rufous shade from costa at antemedial line to medial line at vein 3 ; medial line double, waved, obliquely curved from costa to vein 2, then slightly excurved ; postmedial line obliquely curved, dentate, at veins 4·3 produced to points and with slight fulvous marks on it ; a triangular chocolate brown patch on costa just before apex, the faint waved subterminal line arising from it ; the apex slightly tinged with white ; cilia dark-brown. Hindwing black-brown, the inner margin, terminal area in submedian interspace and termen

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towards tornus whitish ; cilia grey with a brown line through them. Underside of forewing reddish fulvous, the disk fuscous, a fuscous striga from costa towards apex, subterminal line oblique from costa near apex to below vein 7, then dentate, the area beyond it grey ; hindwing reddish fulvous, the inner area and termen greyish, an indistinct curved minutely waved postmedial line.

Habitat.—U.P. ASSAM, Dibrugarh (E. C. Ward). *Exp.* 96 mill. Type in B. M.

NOTODONTIDÆ.

211 *b.* DUDUSA SYNOPLA, Swinh., A. M. N. H. (7), XIX, p. 205 (1907).

♀. Antennæ bipectinate with long branches, the apical part serrate.

Head and thorax rufous mixed with some ochreous scales ; antennæ black; upper part of frons and vertex of head tinged with fuscous ; thoracic crest with some long spatulate black scales ; pectus and legs with fuscous mixed, the mid and hind tibiæ with small tufts of ochreous hair at extremity ; tarsi blackish, fulvous at extemities ; abdomen rufous and ochreous, with broad diffused lateral fuscous bands, the anal tuft with some spatulate black hairs. Forewing ochreous suffused with rufous and slightly irrorated with brown, the veins blackish; a black point below base of cell ; an oblique blackish subbasal diffused line from costa to submedian fold, with ochreous bar beyond it from costa to costal nervure ; antemedial line indistinct, dark, defined by ochreous on inner side, waved, angled outwards on median nervure, crossed by a faint diffused oblique dark fascia from submedian fold to above inner margin near base, a broad diffused oblique blackish fascia from costa beyond it to termen between vein 3 and submedian fold ; postmedial line double filled in with ochreous, waved, oblique from vein 7 to submedian fold, then excurved, a silvery white wedge-shaped mark from its inner edge to beyond it below vein 4 ; a rather diffused dark subterminal line arising at vein 7, oblique to vein 4, excurved to vein 3, then somewhat oblique ; a series of lunules before termen defined by blackish on inner side and with slight double lines on inner side cilia with a series of blackish lunules. Hindwing ochreous almost wholly suffused with fuscous leaving some ochreous at base of inner margin and at tornus ; a terminal series of dark lunules ; cilia pale rufous with series of blackish lunules ; the underside ochreous tinged with rufous and slightly irrorated with fuscous, a black discoidal spot, curved waved postmedial line and subterminal series of black lunules.

Habitat.—ASSAM, Khásis. *Exp.* 118 mill.

215 *a.* RACHIA NODYNA, Swinh., A. M. N. H. (7), XIX, p. 206 (1907).

♂. Head and thorax pale and dark brown ; antennæ and tegulæ blackish ; metathorax with blackish dorsal fascia ; pectus and legs with fuscous mixed ; abdomen fuscous brown, the sides pale towards base. Forewing purplish brown suffused with fuscous ; antemedial line very indistinct, extremely oblique from costa to vein 2 well beyond middle, then very oblique and defined by a pale fascia above to vein 1 and angled outwards above inner margin ; an oblique black streak above middle of inner margin ; a slight pale streak

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in lower end of cell ; a slight dark streak beyond the cell above vein 4 ; postmedial line very indistinct, angled outwards below costa, oblique to antemedial line at vein 2 where it is angled outwards, then oblique and represented by slight black striæ defined by ochreous on outer side ; a slight ochreous subterminal line, dentate and defined by black towards costa, below vein 4 very oblique and strongly defined by black on inner side ; a fine black terminal line. Hindwing white tinged with brown, the veins brown, the costal and inner areas suffused with brown ; a diffused brown subterminal line with whitish line on outer edge, the brown line faint to vein 3, then strong blackish and with small black lunule above it at vein 1 ; termen black brown ; a fine black terminal line ; cilia brown.

Habitat.—ASSAM, Khásis. *Exp.* 76 mill.

220 *a.* PHALERA GONIOPHORA, n. sp.

Head and tegulæ reddish ochreous, the latter with whitish line near tips ; palpi, lower part of frons, antennæ and thorax rufous ; patagia silvery grey ; pectus and legs whitish mixed with brown, the tarsi banded with white ; abdomen with the basal half reddish ochreous, the terminal half brown banded with whitish, the ventral surface whitish. Forewing silvery grey suffused and irrorated with red-brown ; a waved subbasal line from costa to vein 1 ; antemedial line double, with dark points on the veins, somewhat incurved in submedian interspace ; three indistinct waved lines on medial area, with dark points on the veins ; apical patch yellowish white suffused with reddish ochreous except at margins and with three dark striæ from costa, ending at vein 5 and with its outer edge angled at veins 7 and 6, the double, nearly erect postmedial line arising from it and with a series of dark points beyond it ; subterminal line oblique from the apical patch to vein 2 and with some dark points beyond it ; a crenulate brown terminal line intersecting the cilia which are reddish ochreous. Hindwing red-brown tinged with greyish ; cilia yellowish white intersected with rufous. Underside whitish, the forewing suffused with brown except on apical area ; the hindwing with diffused brown medial band from costa to vein 2.

Habitat.—PUNJAB, Dehra Dun ; ASSAM, Khásis (Badgley). *Exp.* 66 mill. Type in B. M.

Larva.—Gregarious; cylindrical; hairy, the hair growing in rings on each segment ; black with brown rings interrupted dorsally ; eight white dorsal and lateral lines, one ventral line and short lines between the feet ; hairs pale brown, nearly white at tips ; feet brown ; head large. Food plant : *Quercus serrata.* 7. 8. 10. (Badgley).

221*c.* PHALERA OCHROPIS, n. sp. (Plate F., f. 8).

Antennæ of male bipectinate, the apex serrate ; forewing with vein 5 from middle of discocellulars, 6 from upper angle.

♂. Head and thorax deep rufous mixed with some ochreous ; pectus, legs and abdomen pale ochreous. Forewing pale ochreous, thickly irrorated with deep rufous ; a strong black fascia below the cell from base to antemedial line ;

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subbasal line represented by an oblique black striga from costa ; antemedial line indistinct, diffused, double filled in with whitish and oblique from costa to median nervure, then black defined on inner side by whitish, oblique, dentate, a black streak beyond it in lower part of cell ; reniform with whitish annulus above and below, interrupted at middle; postmedial line black defined by whitish on outer side, bent outwards below costa, then oblique, dentate, a black streak from it to subterminal line above vein 3, a shorter streak above vein 6 and slight streak above 7 ; subterminal line represented by a series of oblique whitish striæ defined on outer side by black from below costa to vein 2, angled inwards in discal fold ; the terminal area with whitish patches below apex and at middle, a terminal series of blackish points ; cilia rufous with whitish streaks. Hindwing ochreous white suffused with brown ; cilia pale ; the underside ochreous white, the costal area irrorated with rufous.

Habitat.—CEYLON, Haputale (Alston). *Exp.* 52 mill. Type in B. M.

237 *b*. PYDNA BRUNNEA, Swinh., A. M. N. H. (7), XIX, p. 206 (1907).

♂. Head and thorax ochreous mixed with dull red-brown ; abdomen ochreous suffused with reddish brown, the extremity and ventral surface slightly irrorated with brown. Forewing ochreous suffused with dull red-brown except on costal area and below basal half of cell and irrorated with a few black scales ; claviform represented by a slight blackish streak ; a slight pale streak in lower end of cell before the small ochreous-defined discoidal spot ; postmedial line with small blackish spot on costa, bent outwards below costa, then represented by a double series of points, oblique below vein 4, a diffused ochreous mark beyond it on costa and a diffused patch on tornal area ; cilia fuscous brown. Hindwing uniform dark brown ; the underside ochreous tinged with brown except on costal area, a black discoidal spot and rather diffused oblique postmedial line dentate towards costa.

Habitat.—ASSAM, Khásis; CEYLON, Maskeliya. *Exp.* 60 mill.

260*a*. STAUROPUS INCLUSA, n. sp.

Antennæ of male serrate and fasciculate, of female ciliated.

Head and thorax dark red-brown mixed with white ; abdomen grey suffused with rufous. Forewing whitish irrorated with dark red-brown, the inner half of basal area and the terminal area suffused with red-brown ; a brown streak below base of cell ; subbasal line represented by an oblique brown striga from costa ; antemedial line strong, brown, inwardly oblique from costa to median nervure, then nearly erect and slightly angled inwards on vein 1 ; a slight brown discoidal bar ; postmedial line brown arising from costa just beyond antemedial line, oblique to vein 6, then inwardly oblique, dentate and joining the antimedial line at inner margin ; an indistinct pale waved subterminal line with a dark mark before it on costa and lunulate patches from vein 3 to inner margin ; a series of indistinct pale lunules just before termen. Hindwing greyish suffused with red-brown ; an indistinct curved medial line ; cilia whitish at tips.

Habitat.—ASSAM, Khásis (Badgley). *Exp.* ♂ 48, ♀ 52 mill. Type in B. M.

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Larva.—Gregarious ; cylindrical, with a small dorsal hump towards extremity, short scattered hairs ; yellow with black dorsal line ; two lateral lines ; stigmata ringed with black and with black striæ near them ; ventral surface black with broad yellow ventral stripe and yellow lines between the feet, which are black ; head large, red. Food plant : *Quercus griffithii*. 4. 5.

Cocoon.—On or underground ; strong pudding-dish shaped, formed of earth lined with silk.

Pupa.—Somewhat pointed at ends, short, red-brown with black spiracles (Badgley).

260 *b*. STAUROPUS DILUTA, n. sp.

Antennæ of male bipectinate with short fasciculate branches, of female ciliated.

Head, thorax and abdomen rufous mixed with grey. Forewing grey suffused and irrorated with rufous ; traces of a waved subbasal line, oblique towards costa ; traces of a waved antemedial line, double towards costa ; a slight whitish point on upper part of cell towards extremity ; postmedial line rufous, minutely dentate, bent outwards below costa, incurved at discal fold and strongly below vein 4 , subterminal line indistinct, pale, defined by brownish suffusion on postmedial area, incurved between veins 7 and 4 and below vein 3 ; a series of brown striæ before termen defined on inner side by slight pale lunules ; a terminal series of slight brown striæ. Hindwing whitish suffused with red-brown ; cilia white at tips ; the underside whitish tinged with red-brown.

Habitat.—W. CHINA, Omei Shán ; ASSAM, Khásis (Badgley). *Exp.* 42-62 mill. Type in B. M.

Larva.—Solitary ; tapering to both ends ; bright green with a fine red line and white band at sides ; head white with black and red lines and yellow cheeks ; fore feet tipped with pink.

Cocoon.—An oval hollow below the ground with slight papery lining.

Pupa.—Purplish black, roughened, the extremity paler with slight anal projection. Food plant : *Ilex exsalca*. 7. (Badgley).

282 *b*. CHADISRA SEMIFERREA, n. sp. (Plate F., f. 35).

♀. Head and thorax grey mixed with rufous ; palpi black at sides ; tarsi black ringed with grey ; abdomen grey tinged with brown, the basal crest mixed with rufous. Forewing grey irrorated with rufous and fuscous, and with deep ferruginous suffusion from near base to middle except on inner obsolete on costal half, blackish from submedian fold to inner margin to area ; antemedial line obsolete on costal half, blackish from submedian fold to inner margin to which it is bent inwards; a blackish medial line, rather oblique from costa to vein 2, then strongly bent inwards and erect to inner margin ; a deep rufous discoidal bar with some white above it and on outer edge ; postmedial line formed of black striæ slightly defined by white on outer side, oblique from costa to vein 6 and incurved below vein 2 ; a dark patch on postmedial part of costa with some whitish points on costa and two slight dark streaks above veins 7. 6. before the white subterminal line which is

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incurved below costa and vein 2 and minutely dentate between those points, a series of small black spots defined by white on inner side before termen; a fine black terminal line. Hindwing grey suffused with brown, a rather darker terminal line; the underside rufous, the inner area pale.

Habitat.—CEYLON, Trincomali (Green). *Exp.* 50 mill. Type in B. M.

293*b*. NOTODONTA COLLARIS, Swinh., A. M. N. H. (7), XIV., p. 132 (1904).

♂. Palpi, frons, antennæ and thorax red-brown; vertex of head and telugæ white, the latter with black tips; tarsi with pale rings; abdomen red-brown with dark dorsal patch at extremity. Forewing pale, almost entirely suffused with red brown, leaving the submedian interspace and the area below costa towards apex paler; the costal area to beyond middle, the cell, and area from below end of cell to near termen below vein 4 and the terminal area below apex suffused with fuscous; a white point at base of median nervure; two fine brown streaks in basal half of submedian fold; traces of an irregular brown antimedial line; some dark points in end of cell and a slight discoidal bar; traces of an oblique dentate postmedial line; the apical half of terminal area with dark streaks in the interspaces and short oblique streaks below extremities of veins 4 and 3. Hindwing red-brown.

Habitat.—ASSAM, Khásis. *Exp.* 48 mill.

ÆGERIADÆ.

Genus SPHECOSESIA, nov.

Type.—*S. pedunculata.*

Proboscis fully developed; palpi upturned, fringed with long hair in front at base, the 2nd joint reaching to about vertex of head, the 3rd moderate; antennæ of male minutely serrate and fasciculate, strongly dilated beyond middle; legs without tufts of hairs on the joints; abdomen strongly pedunculate at base and narrowing to extremity. Forewing with vein 2 present; 7·8 stalked. Hindwing with the discocellulars erect; veins 3·4 stalked.

362*a*. SPHECOSESIA PEDUNCULATA, n. sp. (Plate F., f. 14).

♂. Head and thorax dark brown mixed with rufous; palpi yellow suffused with rufous; frons with lateral white lines; basal joint of antennæ white in front; coxæ whitish; tibiæ with whitish bands at middle and extremity, the tarsi whitish at base; abdomen dark reddish brown with white segmental lines on the dilated part, the extremity rufous, the ventral surface with rufous segmental lines. Wings hyaline, the veins and margins dark brown.

Habitat.—SIKHIM (Bingham). *Exp.* 28 mill. Type in B. M.

367*a*. ÆGERIA CYANOPASTA, n. sp. (Pl. F., f. 20).

Antennæ with long cilia.

♂. Head, thorax and abdomen black irrorated with silvery blue scales; neck with orange ring. Forewing black shot with purple and irrorated with metallic blue green scales; an orange streak above inner margin before middle, a wedge-shaped patch in end of cell and an elliptical patch beyond the cell between veins 8 and 3 with slight dark streak on the veins. Hindwing hyaline, the veins and margins black-brown; an oblique discoidal bar. Underside of

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forewing mostly orange to beyond middle, a patch beyond cell and maculate terminal band from apex to vein 2; hindwing with some orange scales on the veins.

Habitat.—QUETTA (Nurse). *Exp.* 26 mill.

368*a*. ÆGERIA PYRODISCA, n. sp. (Plate F., f. 26).

Antennæ of male strongly ciliated.

♂. Palpi orange, yellow in front and with a few black scales at sides; frons yellow, white at sides; antennæ black above, orange below; vertex of head and thorax blue-black mixed with some orange and with fine orange streak on dorsum and upper edge of patagia; pectus mostly yellow; legs red-brown banded with yellow; abdomen blue-black with narrow yellow segmental lines, the anal tuft red-brown and yellowish, the ventral surface with broader yellow bands. Forewing hyaline, the veins and margins narrowly brown with some yellowish scales; a slight firey red mark near base; a narrow fiery red band on outer edge of the black discoidal line and a streak above vein 9; cilia brown. Hindwing hyaline, the veins and margins narrowly black; cilia brown.

♀. Antennæ fulvous above beyond middle; abdomen with the yellow bands broad at sides, the anal tuft with much more yellow, the ventral surface yellow with reddish orange bands.

Habitat.—BURMA, Maymyo (Barrow). *Exp.* ♂ 28, ♀ 32 mill. Type in B. M.

383*b*. LEPIDOPODA ANDREPICLERA, n. sp. (Plate F., ff. 15 ♂, 27 ♀).

♂. Head and thorax black-brown; palpi in front, sides of frons and neck white; pro- and metathorax, pectus, and legs with some whitish scales; hind tibiæ bluish silvery at base and with white medial band, the base of tarsus white; abdomen black suffused with brilliant blue. Forewing hyaline, a costal fascia, discoidal bar, veins, margins and a series of streaks in interspaces of terminal area, blue-black. Hindwing hyaline, the veins and margins black.

♀. Head and thorax with golden yellow replacing the white except at sides of frons; legs golden yellow; hind tibiæ with black band, the tarsus black except 1st joint. Forewing with the interspaces suffused with golden yellow, the discoidal bar yellow.

Habitat.—CEYLON, Kandy (Green). *Exp.* ♂ 28, ♀ 32 mill. Type in B. M.

Genus SCOLIOMIMA.

Scoliomima, Butl., Trans. Ent. Soc., 1885, p. 371 ..... *Type insignis.*

Proboscis fully developed; palpi upturned, reaching vertex of head, the 1st and 2nd joints clothed with long rough hair, the 3rd moderate; antennæ of male bipectinate with short branches to apex; tibiæ clothed with long rough hair; mid tarsus with the 1st joint clothed with short hair, hind tarsus with it clothed with very long hair; abdomen clothed with rough hair towards extremity. Forewing with veins 2·3 from near angle of cell; 4·5 from above angle; 6 from below upper angle; 7·8 stalked; 9·10·11 from cell. Hindwing with vein 2 from before angle of cell; 3·5 from angle, 4 absent; 6 from

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below upper angle becoming coincident with 5 before termen or separate ; 7 from angle.

395*a*. SCOLIOMIMA INSIGNIS, Butl., Trans. Ent. Soc. 1885, p. 371, pl. X., f. 10.

♂. Head, thorax and abdomen black, shot with bluish; palpi with the 2nd joint golden yellow ; frons white at sides ; tegulæ golden yellow ; metathorax with some fulvous hairs ; mid tibiæ with some bluish white hairs at base and on outer side at middle, and extremity ; tarsi with the terminal joints yellow ; abdomen with dorsal yellow band on 4th segment, narrowing at middle, some yellow hair in anal tuft ventrally. Forewing cupreous brown, the costal and inner margins black ; a hyaline streak below base of cell. Hindwing cupreous brown ; the inner margin and cilia towards tornus black with a greenish tinge ; a hyaline streak below base of cell and a triangular patch on inner area from near base to termen.

The type from Borneo has a golden-yellow patch on metathorax and subdorsal yellow patches on 1st segment of abdomen ; wings, darker.

Habitat.—MADRAS, Palni Hills (W. H. Campbell) ; BORNEO. *Exp.* 52·54 mill.

SYNTOMIDÆ.

442. SYNTOMIS PASSALIS.

Larva.—Fuscous black clothed with tufts of close downy hairs (W. H. Campbell).

ZYGÆNIDÆ.

CHALCOSIANÆ.

528*a*. SORITIA VIRIDIBASALIS, Dudgeon, J. Bomb. Soc., XVI., p. 399 (1905).

♂. Head and thorax fuscous brown ; tegulæ crimson ; 1st joint of palpi and pectus yellowish white, abdomen pale blue, the first three segments fuscous brown, the ventral surface yellowish white. Forewing dark brown, the basal two-thirds suffused with green, the veins of terminal area defined by blue-green; a narrow oblique pale yellow postmedial band from costa above end of cell to tornus. Hindwing fuscous brown. Underside of forewing fuscous brown, the band broader with a curved pale blue subapical band beyond it ; hindwing with the cell, a streak on each side of vein 1. c., and four subterminal lunules pale blue.

Habitat.—TENASSERIM, Daunat Range. *Exp.* 36 mill. This species is unknown to me.

557. *Heterusia drataraja* is the male of 571. CHALCOSIA DISTINCTA and insert (syn.) *Eterusia osseata*, Wlk., XXXI, 120 (1864).

590*a*. *Isbarta cyanescens* is the male of 591. ISBARTA BINGHAMI.

PSYCHIDÆ.

ŒCETICINÆ.

617*a*. CLANIA DESTRUCTOR, Dudgeon, J. Bomb. Soc., XVI, p. 401 (1905).

Forewing with veins 4·5 stalked to near termen, the veinlets between vein 1 and inner margin slight ; hindwing with veins 4·5 strongly stalked ; vein 8

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anastomosing with the cell towards extremity, then again with vein 7, the veinlets between it and costa slight.

Head, thorax and abdomen reddish brown mixed with greyish and dark brown ; tarsi whitish. Forewing red-brown mixed with greyish, the veins streaked with blackish ; an elleptical whitish mark below veins 4·5 and a small triangular mark on termen below vein 7. Hindwing reddish brown mixed with greyish, the veins blackish.

Habitat.—SIKHIM ; BHUTÁN ; ASSAM, Chittagong; BORNEO, Kuching. *Exp.* 30 mill.

Larva.—Food plant : Tea, the larva case formed of twigs of the plant placed longitudinally.

618*a*. CLANIA MONOCHROMA, n. sp.

♂. Head, thorax and abdomen dark brown with some greyish hair ; wings uniform dark brown. Forewing with three veinlets between vein 1 and inner margin. Hindwing with veins 4·5 stalked ; 7 connected with 8 by an oblique bar near end of cell ; 8 without veinlets to costa.

Larva.—Case covered with white silk to which are attached excreta and a few pieces of bark and twigs.

Habitat.—CEYLON, Kandy (Green). *Exp.* 32 mill. Type in B. M.

618 *a*. CLANIA ANTRAMI, n. sp.

♂. Forewing with veins 4·5 from cell ; hindwing with vein 6 absent, 8 not sending branches to costa.

Head, thorax and abdomen greyish fuscous. Forewing ochreous thickly irrorated with fuscous, very thickly on terminal half. Hindwing fuscous brown, the inner area paler.

Habitat.—CACHAR, Kuttal (C. B. Antram). *Exp.* 24 mill. Type in B. M.

Larva.—Case covered with fragments of dry leaves ; Food plant : Tea.

620 *a*. AMATISSA ALBITARSIA, n. sp.

♂. Fore tarsus with the terminal joint moderate ; fore and hindwings with veins 4·5 stalked ; uniform reddish brown ; the fore tarsi whitish.

Habitat.—CEYLON, Hatiyantota (Green). *Exp.* 22 mill. Type in B. M.

CHALIANÆ.

633. MANATHA SCOTOPEPLA, n. sp.

♂. Forewing with veins 4·5 from cell, 11 connected at a point with 12. Uniform fuscous brown ; the tarsi pure white.

Habitat.—CACHAR, Kuttal (C. B. Antram). *Exp.* 14 mill. Type in B. M.

Larva.—Case covered with scales of bark ; Food plant ; Tea.

644 *a*. MAHASENA TAPROBANA, n. sp.

Forewing with veins 8·9 very shortly stalked.

♂. Uniform red-brown with some greyish hair mixed.

Habitat.—CEYLON, Peradeniya (Green). *Exp.* 22 mill. Type in B. M.

Larva.—Case covered with short pieces of stick somewhat spirally attached.

645 *b*. MAHASENA THEIVORA, Dudgeon, J. Bomb. Soc., XVI., p. 400 (1905). Fore and hindwings with veins 4·5 from a point.

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♂. Uniform fuscous brown, the tarsi whitish.

Habitat.—SIKHIM. *Exp.* 30-34 mill.

Larva.—Food plant: Tea, the larva-case formed of fragments and whole leaves attached to a rather soft case.

645 *a.* MAHASENA POLIOTRICHA, n. sp.

Forewing with veins 4·5 from angle of cell.

♂. Head and thorax clothed with long silky whitish grey hair mixed with some fuscous; abdomen fuscous, the ventral surface whitish grey; wings greyish fuscous, the cilia white.

Habitat.—PUNJAB, Kangra Valley, 4,500′ (Dudgeon). *Exp.* 34 mill. Type in B.M.

Larva.—Case formed by short pieces of the stems of grasses arranged in a whorl with three or four twists. It has a Hymenopterous parasite of the genus *Chalcis*.

ARBELIDÆ.

675 *b.* ARBELA CAMPBELLI, n. sp. (Pl. F., f. 7).

♂. Head, thorax and abdomen dark brown mixed with grey; antennæ with the branches rufous. Forewing grey thickly irrorated and striated with dark brown, the veins and submedian fold streaked with white; some white at base of inner margin; antemedial line formed of white striæ, from subcostal nervure to inner margin; two white discoidal striæ and a striga below extremity of cell; postmedial striæ between veins 6 and 3, and vein 2 and inner margin; a curved subterminal series of striæ placed somewhat in echelon: terminal oblique striæ from just above vein 3 to tornus; cilia white, tinged with brown at base and with dark line at middle. Hindwing white suffused and irrorated with brown; cilia brownish at base, white at tips; the underside white striated with brown forming ill-defined lines, a terminal series of small brown spots.

Habitat.—MADRAS, Horsleyhonda (Campbell). *Exp.* 36 mill.

The larva tunnels in the stem of *Ochna squarrosa* (W. H. Campbell).

676 *b.* ARBELA THEIVORA, n. sp. (Pl. G., f. 1).

♂. Head and thorax dark brown mixed with grey; abdomen fuscous mixed with grey, the basal crest blackish; pectus, legs and ventral surface of abdomen whiter. Forewing dark brown slightly irrorated with grey; the costal area, cell and vein 1 tinged with rufous; a faint blackish discoidal spot; the terminal area with faint dark striations. Hindwing fuscous brown slightly irrorated with grey, the cilia whitish at tips.

♀. Much greyer; forewing with numerous dark reticulate striations

Habitat.—ASSAM, Sylhet, Gazipur (Antram). *Exp.* ♂ 18, ♀ 22 mill. Type in B. M.

Larva.—Bores in the bark of Tea and the smaller branches of the Mango, feeding under a web.

676 *c.* ARBELA MINIMA, n. sp. (Pl. F., f. 24).

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♂. Head and thorax red-brown mixed with some white; pectus and legs mostly white; abdomen red-brown, the tuft of long hair on basal segment white with some spatulate brown scales, the ventral surface white. Forewing fulvous yellow very thickly irrorated with red-brown, the basal half and costal area with fulvous yellow spots defined by blackish; a round blackish discoidal spot with a fulvous yellow spot beyond it; cilia with a dark line through them and whitish patches above and below middle and at tornus. Hindwing golden brown; cilia white at tips, the inner margin fringed with long white hair.

Habitat.—CEYLON, Galle (Bainbrigge-Fletcher). *Exp.* 18 mill. Type in B.M.

HEPIALIDÆ.

678 *a*. PALPIPHORUS PELLICIA, Swinh., A.M.N.H. (7), X, p. 152 (1905).

Head and thorax red-brown; abdomen fuscous brown. Forewing red-brown with slight greyish irroration; a white point with some dark scales round it in middle of cell and a smaller point rather nearer base below the cell; traces of oblique medial, postmedial and subterminal series of brown spots defined at sides by slight whitish striæ. Hindwing brown with a purplish tinge; a whitish patch on termen and cilia above middle.

Habitat.—ASSAM, Khásis. *Exp.* ♂ 24, ♀ 28 mill.

DREPANIDÆ.

732. DREPANA SPECULARIS, insert (syn) *Platypteryæ obtruncata*, Warr., Nov. Zool., VII, p. 118 (1900). The locality Bahia is a mistake.

735. DREPANA SADANA, insert (syn) *Tridrepana adelpha*, Swinh., A.M.N.H (7), XVI, p. 620.....Khásis.

735. *a*. DREPANA RUBROMARGINATA, Leech, Trans. Ent. Soc., 1898, p. 365.

♂. Orange yellow. Forewing with indistinct somewhat diffused dark antemedial line from subcostal nervure to inner margin, strongly excurved below the cell; a small spot in middle of cell and discoidal spot; blackish spots below end of cell above veins 3·2; a slight oblique waved postmedial line from vein 7 to inner margin; the terminal area suffused with bright rufous obliquely from apex to postmedial line at lower angle of cell and thence to inner margin; a diffused lunulate band beyond the postmedial line from vein 5 to inner margin, somewhat incurved below vein 2; a diffused subterminal series of lunulate spots, the spot above vein 5 blackish. Hindwing with dark point at upper angle of cell and slight diffused medial line from cell to inner margin; diffused spots above bases of veins 3·2; a slight diffused waved postmedial line, excurved from costa to vein 3, then bent inward and a subterminal series of small lunulate spots from vein 6 to inner margin.

Habitat.—W. CHINA, Pu-tsu-fong; SIKHIM, TIBET, Yatong. *Exp.* 40 mill.

746. *b*. PHALACRA RUFA, n. sp. (Pl. F., f. 28).

♂. Head and thorax rufous slightly irrorated with grey, the vertex of head whitish; pectus and legs fuscous brown; abdomen rufous slightly banded with fuscous. Forewing rufous, the costal area suffused with grey and irrora-

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ted with fuscous ; traces of an antemedial line angled on median nervure, then oblique ; two obliquely placed black discoidal points ; an indistinct dark, minutely waved postmedial line, slightly excurved below costa, then very oblique ; an indistinct subterminal line with yellowish marks on it, excurved from costa to vein 4, then oblique and slightly sinuous ; a series of slight black points before termen. Hindwing rufous ; the base yellowish ; an oblique subbasal greyish band defined by fine dark lines ; three oblique minutely waved medial lines ; a straight subterminal line from below apex to inner margin ; cilia grey at tips.

Habitat.—CEYLON, Maskeliya (Alston). *Exp.* 50 mill. Type in B.M.

146. *c.* PHALACRA TENERA, Swinh., Trans. Ent. Soc., 1902, p. 592 (Pl. F., f 33).

♀. Head, thorax and abdomen brownish white mixed with brown. Forewing brownish white irrorated with brown, the medial area suffused with brown and bounded by minutely waved lines, on inner side obliquely curved, on outer incurved at discal fold and oblique below vein 4 ; a black point at lower angle of cell ; a minutely waved postmedial line with series of small black spots beyond it, oblique below vein 4 ; traces of a subterminal series of small pale lunules, incurved below vein 4 and with some fuscous before and beyond it towards tornus ; a fine black terminal line ; cilia chequered black and whitish. Hindwing suffused with rufous except basal area ; traces of two antemedial lines ; a black discoidal point ; an indistinct minutely waved medial line ; two waved fuscous postmedial lines ; traces of a greyish lunulate subterminal line ; a slight terminal line.

Habitat.—CEYLON, Kandy ; BORNEO, Pulo Laut. *Exp.* 26 mill.

THYRIDIDÆ.

764. STRIGLINA GLAREOLA, insert (syns) *Striglina conjuncta*, Swinh., A. M. N. H. (7), XVII, p. 381 (1906) and *Striglina mediofascia*, Swinh., A. M. N. H. (7), XVII, p. 381 (1906).

766 *a.* RHODONEURA CANDIDALIS, Swinh., A. M. N. H. (7), XV., p. 504 (1905.)

♂. Head and thorax white, suffused with fuscous except behind ; tarsi banded with fuscous ; abdomen white. Forewing white, the costa and cell with numerous fuscous striæ and a few on basal, medial and postmedial areas ; postmedial line formed of a double series of striæ, oblique, slightly incurved to costa and below vein 4 ; a subterminal series of double obliquely placed striæ ; two black points just before termen below apex followed by an oblique series of striæ in the interspaces. Hindwing white ; a double subbasal line not reaching inner margin ; a double medial line formed of striæ meeting and terminating at vein 1 ; a double subterminal line starting from a single striga below costa, the outer line ending at vein 2, the inner at vein 1 ; some striæ on apical part of termen. Underside of forewing with some golden suffusion in basal half of cell, below costa to beyond middle, and between medial parts of postmedial and subterminal lines.

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Habitat.—ASSAM, Silchar. *Exp.* 34 mill.

767 *a.* RHODONEURA ERUBESCENS, Warr., Nov. Zool. XV., p. 347 (1908).

♂. Head and thorax brown, the latter whitish behind; pectus and legs white suffused with brown and crimson, the tarsi brown ringed with white; abdomen white tinged with crimson. Wings white suffused in parts with brownish crimson and thickly reticulated with brown lines, the veins streaked with pale crimson on terminal half; the cilia pale crimson; forewing with blackish points on costa towards apex; hindwing with the basal area paler. Underside with the markings crimson; forewing with chestnut suffusion in and below end of cell and below costa towards apex, some black striæ in lower part of middle of cell, the veins beyond upper angle of cell streaked with black; hindwing with black striæ from costa.

Habitat.—ASSAM, Khàsis; BURMA, Shàn States, Maymyo. *Exp.* 38 mill.

777 *a.* RHODONEURA NOX, Druce, A. M. N. H. (7), I, p. 149 (1898).

♀. Black-brown slightly shot with purple; pectus brown mixed with ochreous white; legs brown, the tarsi ringed with white; ventral surface of abdomen ochreous. Forewing with faint dark reticulations; an indistinct oblique greyish line from costa near apex to middle of inner margin; cilia brownish at apex and above tornus. Hindwing with indistinct oblique greyish medial line; cilia whitish with a brown line through them. Underside of both wings mottled with ochreous except terminal area, the dark striæ forming numerous ill-defined lines; forewing with two dark spots on medial part of costa and two on median nervure.

Habitat.—BURMA, Tenasserim. *Exp.* 22 mill.

778. RHODONEURA *Nitens*, insert *Pyralis* acutalis, Wlk., XXXIV, 1523 (1865), which has precedence, and *Pharambara fulvipicta*, Warr., Nov. Zool., XV, p. 343 (1908).

784. RHODONEURA ATRIPUNCTATIS insert (syns)

,, *mollicellalis*, Swinh., A. M. N. H. (7), XV, p. 504 (1905).

,, *turbatalis*, Swinh., A. M. N. H. (7), XV, p. 505 (1905).

Brixia comparalis, Warr., Nov. Zool., XV, p. 329 (1908).

The second is a variety with the basal half of both wings pale; a pale patch on inner area of forewing towards tornus; the apical area of hindwing pale to submedian fold.

786. RHODONEURA RETICULATA, Moore, 1888 (nec. Butl., 1886) will stand as *Rhodoneura moorei*, Warr., Nov. Zool., XV, p. 343 (1908).

786 *a.* RHODONEURA DISSIMULANS, del. *Banisia ordinaria*, Warr., which is distinct.

786 *c.* RHODONEURA PLUMBEA, Warr., Nov. Zool., XV, p. 344 (1908).

Head, thorax and abdomen red-brown with a silvery gloss; pectus, legs and ventral surface of abdomen pale rufous. Forewing red brown with a silvery gloss and numerous brown striæ; two fine well separated antemedial lines; postmedial line double, excurved beyond the cell; subterminal line forking towards costa and tornus. Hindwing red-brown with a silvery gloss and

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numerous brown striæ ; a slight antemedial line, a double waved medial line and a subterminal line forking towards costa and tornus. Underside paler suffused with chestnut red ; forewing with fine black and white streaks in and beyond upper part of cell.

Habitat.—SIKHIM. *Exp.* 28-38 mill.

786 *d.* RHODONEURA TÆNIATA, Warr., Nov. Zool., XV, p. 327 (1908).

Head, thorax and abdomen rufous with a whitish tinge. Forewing whitish tinged with rufous and with numerous red-brown striæ ; a rufous subbasal band from costa to median nervure ; an antemedial rufous band ; medial band rufous, slightly angled outwards in cell and expanding at inner margin ; postmedial band rufous, broad from costa to vein 5 where it is angled outwards, then narrower, incurved and expanding at inner margin ; an oblique wedge-shaped band from costa towards apex to near termen at vein 5, enclosing a pale spot on costa ; a patch on tornal area produced above to two points extending to vein 4 ; cilia deep rufous. Hindwing whitish suffused with rufous and with numerous red-brown striæ ; an indistinct rufous medial band, forking above and ending in dark points at and beyond upper angle of cell ; an indistinct subterminal rufous band from below costa to vein 5 ; cilia deep rufous. Underside similar.

Habitat.—SIKHIM ; ASSAM, Khàsis. *Exp.* 42 mill.

792. RHODONEURA FERROFUSA, trans. ad. 805. b HYPOLAMPRUS after *H. atrostriatus.*

792 *c.* RHODONEURA RUINOSA, Warr., Nov. Zool. XV., p. 344 (1908).

♂. Head, thorax and abdomen whitish tinged with rufous, the vertex of head and extremity of abdomen paler. Forewing whitish, with numerous rufous striæ, the basal half suffused with rufous ; indistinct curved antemedial, medial and postmedial narrow rufous bands, a rufous mark beyond the last below costa on the inner edge of a red-brown line which is excurved from below costa to tornus ; an oblique narrow red-brown band across apical area. Hindwing whitish with numerous rufous striæ, the basal half suffused with rufous ; fine red-brown medial and subterminal lines, the former evenly curved, the latter excurved, then bent outwards to termen above tornus. Underside of forewing with black points on costa and fine black and white streaks beyond upper angle of cell, a blackish patch at lower angle of cell with band from it to inner margin, the postmedial line and subapical band distinct ; hindwing with irregular medial band except towards costa.

Habitat.—Sikhim. *Exp.* 30 mill.

792. *d.* RHODONEURA DISCOPIS, n. sp. (Pl. F., f. 19).

♀. Head, thorax and abdomen pale rufous. Forewing pale rufous with numerous lines formed of brown striæ, the more conspicuous being an antemedial line oblique from costa to median nervure, then erect, an oblique line from lower angle of cell to inner margin, and a postmedial line oblique to vein 4, then slightly incurved ; a brown discoidal annulus. Hindwing pale rufous with numerous prominent reticulate lines formed of brown striæ ; a small

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brown discoidal annulus. Underside with the reticulate lines very distinct; forewing with rounded black-brown discoidal patch; hindwing with black-brown discoidal annulus.

Habitat.—CEYLON, Hapatale (Alston). *Exp.* 30 mill. Type in B. M.

793*a*. RHODONEURA FERRUGINOSA, Hmpsn., A. M. N. H. (7), XVII, p. 121 (1906).

♂. Bright feruginous red. Forewing with numerous indistinct deep rufous striæ; a rufous postmedial line, excurved from costa to vein 4, then incurved, with some deeper rufous suffusion before it; the striæ on terminal area forming an ill-defined sinuous subterminal line. Hindwing with numerous deep rufous striæ forming ill-defined lines. Underside with a slight silvery gloss, the striæ rather more prominent.

Habitat.—SIKHIM. *Exp.* 30 mill.

793 *b*. RHODONEURA FALLAX, Warr. A. M. N. H. (6), XVIII, p. 229 (1896).

Head, thorax and abdomen dark violaceous grey tinged with brown; pectus, legs and ventral surface of abdomen whitish. Forewing dark violaceous grey, thickly and evenly striated with fine dark lines, some of the striæ forming a slight rather oblique medial line, a slightly curved postmedial line and an oblique line across apical area; a slight brownish patch beyond discocellulars. Hindwing dark violaceous grey, thickly and evenly striated with fine dark lines, some of the striæ forming an oblique line across apical area. Underside of forewing with metallic blue and black points in end of cell with some fine white streaks above them, some fine white and black streaks beyond upper angle of cell and an orange-red fascia below apical half of costa; hindwing whitish with the striæ prominent, a forked rufous line from costa before apex to termen at vein 2.

ab. 1. Medial area of forewing and apical area of hindwing suffused with black above.

Habitat.—ASSAM, Khàsis; BALI; NEW GUINEA, *Fergusson* I. *Exp.* 22 mill.

797. RHODONEURA BRACTEATA, insert (syn.) 798. *Rhodoneura rufareta.*

797 *a*. RHODONEURA INTIMALIS, insert (syns).

Rhodoneura canidentalis. Swinh., A. M. N. H. (7), XVIII, p. 381 (1906).
Microbelia fasciata, Warr. Nov. Zool. XV., p. 341 (1908).
,, *privata*, Warr. Nov, Zool. XV., p. 341 (1908).
,, *uniformis* Warr. Nov. Zool. XV., p. 341 (1908).
Rhodoneura giulia, Swinh. A. M. N. H. (7) X. p. 50 (1902).

797*b*. RHODONEURA NEPHELOPERA, Hmpsn., A. M. N. H. (7), XVII p. 119 (1906).

Head, thorax and abdomen deep rufous; front of thorax and dorsum of abdomen with a purplish-silvery gloss; pectus, legs, and ventral surface of abdomen rather paler; wings rufous with a golden gloss, thickly and nearly evenly reticulate with pale and deep rufous lines. Forewing with the base, costal area, and area beyond the cell to apex and down to vein 3 deep rufous suffused with purple; cilia with two white patches at tips below apex and two

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above tornus. Hindwing with the extreme base deep rufous ; cilia with the tips chequered white and rufous. Underside of forewing with the subcostal nervure and base of veins beyond upper angle of cell finely streaked with black and white, the terminal area between veins 8 and 2 suffused with purple, with a curved white streak below extremity of vein 8.

Habitat.—ASSAM, Khásis. *Exp.* 24 mill.

797 *c.* RHODONEURA LACTIGUTTATA, n. sp.

♂. Head and thorax white mixed with some rufous ; fore tibiæ and the tarsi brown ringed with white ; abdomen white with rufous segmental lines. Forewing white thickly reticulated with rufous ; a brown-defined antemedial annulus in and below cell with a forked line from its outer edge to inner margin, and a streak from its upper edge to a small quadrate brown spot at upper angle of cell, giving off two lines to inner margin, the inner excurved, the outer angled outwards at vein 4, then incurved and forked towards inner margin, also a streak to apex intersected by an oblique line across apical area ; the reticulations of terminal area forming small round spots. Hindwing white thickly reticulated with red-brown forming small round spots not forming definite lines ; a dark brown point at upper angle of cell ; cilia of both wings rufous. Underside of forewing with the costal area red-brown and with slight streaks of metallic and black scales in cell and on the veins below costa to apex.

Habitat.—BHUTAN, 3,000′ (Dudgeon). *Exp.* 20 mill. Type in B. M.

800 *b.* RHODONEURA DORILUSALIS, Wlk., XIX, 890 (1859).

Pyralis imbutalis, Wlk., XXXIV ; 1524 (1865).

Siculodes acutipennis, Pag., Naas. Jahrb. f. Naturif., XXXIX, p. 166 (1886).

Head, thorax and abdomen whitish mixed with red-brown. Forewing whitish tinged with rufous and striated with dark brown; traces of an oblique medial band ; a more distinct postmedial band from costa to discal fold and lower angle of cell to inner margin ; a curved subterminal series of striæ forking towards costa. Hindwing whitish tinged with rufous and striated with dark brown ; an oblique postmedial band formed of dark striæ ; a subterminal line formed of striæ and a spot at tornus. Underside of forewing with white subterminal band from below apex to vein 5.

Habitat.—NICOBARS, Nancowry ; BORNEO ; PULO LAUT ; MYSOL ; ARU. *Exp.* 26 mill.

800 *c.* RHODONEURA CUPRIZONA, n. sp.

♂. Head, thorax and abdomen greyish largely suffused with bright rufous. Forewing greyish white, the basal half of inner area with some rufous and silvery striæ ; an oblique diffused cupreous red postmedial band bent inwards to costa confluent with a large diffused patch from apex and leaving a triangular whitish patch on costa beyond middle ; a blackish discoidal lunule, a small spot beyond lower angle of cell and two points in discal fold ; a subterminal series of slight blackish points ; two slight subapical whitish lunules defined by blackish

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on inner side. Hindwing whitish tinged with rufous, the basal area striated with rufous and silvery ; an oblique rufous medial band with silvery striæ on its inner and outer sides ; traces of a subterminal series of dark points and striæ ; the underside with medial and subterminal rufous bands.

Habitat.—ASSAM, Khásis (Badgley). *Exp.* 36 mill. Type in B. M.

801 *a*. HYPOLAMPRUS SUBUMBRATA, Warr., Nov. Zool., XII, p. 7 (1905).

♀. Head, thorax and abdomen pale rufous irrorated with a few glistening scales. Forewing pale rufous with a silky gloss and thickly striated with brown, some of the striæ forming indistinct antemedial, medial and double postmedial and subterminal lines. Hindwing pale rufous with a silky gloss and thickly striated with brown, the terminal half rather paler and with double curved postmedial and subterminal lines filled in with rather darker rufous ; a slight waved line before termen. Underside of forewing with deeper rufous shade on costal half to beyond cell.

Habitat.—BURMA, Shán States, Maymyo. *Exp.* 36 mill.

802 *a*. HYPOLAMPRUS SIMPLEX, Warr., Nov. Zool. XV, p. 337 (1908).

♀. Head, thorax and abdomen whitish tinged with rufous. Wings whitish suffused with pale pinkish rufous and faintly striated and irrorated with brown. Underside of forewing with blackish points on costa, black and opalescent streaks in, below and beyond the cell, the terminal area with blackish reticulations ; an apical white patch with black point on it; hindwing with diffused dark medial band and blackish reticulations on terminal area.

Habitat.—BURMA, Shán States, Maymyo ; BORNEO, Kuching. *Exp.* 20 mill.

805 *b*. HYPOLAMPRUS OCELLIPENNIS, Warr., Nov. Zool., XV, p. 327 (1908).

Both wings with the termen excised below apex and strongly excurved at middle.

♂. Head, thorax and abdomen whitish suffused with rufous. Forewing rufous to well beyond middle leaving a series of small whitish spots on inner margin and a reticulate elliptical medial patch between the cell and vein 1, the outer edge of the rufous area angled at veins 5 and 2 ; terminal area yellowish white with red brown reticulations ; an oblique rufous line from costa towards apex to termen at vein 5, then strongly incurved to a small spot just below vein 5 and bent outwards to a small spot at tornus. Hindwing yellowish white with red-brown reticulations ; a medial rufous band with irregular edges ; the reticulate lines of terminal area forming an oblique line across apical area and enclosing some elliptical spots on postmedial area. Underside similar.

Habitat.—LOWER BURMA. *Exp.* 38 mill.

805 *c*. HYPOLAMPRUS LEPRAOTA, n. sp. (Plate F., f. 17).

♀. Head, thorax and abdomen ochreous white mixed with rufous. Forewing yellowish white thickly reticulated with rufous ; the costal area suffused with rufous expanding into the cell before middle ; a postmedial line angled outwards at veins 5 and 2 and incurved between those points, with a broad rufous band on its inner edge ; a fine subterminal line arising from a triangular mark on costa, then oblique to a quadrate spot on termen at vein 5, then strongly

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incurved and ending in a quadrate spot on termen above tornus. Hindwing yellowish white thickly reticulated with rufous; a small rufous spot at lower angle of cell conjoined to a spot on vein 2; the terminal area with stronger reticulate lines.

Habitat.—CEYLON, Madulsima (W. Vaughan). *Exp.* 24 mill. Type in B. M.

806. HYPOLAMPRUS SUBROSEALIS, insert ab. *rubicunda*, Warr., Nov. Zool. XV., p. 336 (1908).

806 *c*. HYPOLAMPRUS ALBIPUNCTULA, Warr., Nov. Zool., XV, p. 335 (1908).

♂. Head, thorax and abdomen whitish tinged with rufous; tarsi brown ringed with white. Forewing whitish suffused with rufous and with numerous rather indistinct brown striæ; two indistinct antemedial lines; an indistinct oblique brownish postmedial band with three white points beyond it above vein 6. Hindwing white with brown reticulations and slight rufous suffusion leaving numerous small round white spots; a black point in discal fold just beyond the cell and a postmedial point. Underside of both wings with blackish reticulations; forewing with minute black streaks in, below and beyond the cell with opalescent suffusion between them.

Habitat.—MANIPUR; LOWER BURMA. *Exp.* 24 mill.

Genus SYMPHLEPS.

Symphleps, Warr., Nov. Zool., IV., p. 383 (1897). Type *cochracea*.

Proboscis fully developed; palpi upturned, not reaching vertex of head; antennæ laminate; hind tibiæ with the inner medial spur very long, the outer minute. Forewing with vein 3 from before angle of cell; 5 from above angle; 6·7 from below upper angle; 8, 9, 10 stalked; 11 from cell. Hindwing with vein 3 from before angle of cell; 5 from above angle; 7 from upper angle, anastomosing with 8.

808*b*. SYMPHLEPS OCHRACEA, Pag., Nass. Jahrb. f. Naturf., XXXIX, p. 139 (1886).

Rhodoneura alomosalis, Hmpsn., P. Z. S., 1897, p. 621.

Head and thorax bright rufous; antennæ ringed with white; tarsi slightly ringed with white; abdomen paler rufous with slight whitish segmental lines; wings pale rufous thickly and evenly striated with deep rufous. Forewing with series of white points on costa; a slight white discoidal bar with some black scales at its lower extremity; cilia deep rufous with series of black points at base. Hindwing with series of black points at base of cilia. Underside of forewing with two small white discoidal spots ringed with black.

Habitat.—ASSAM, Khásis; ANDAMANS; SINGAPORE; PULO LAUT; JAVA; AMBONIA; MYSOL; ARU; QUEENSLAND. *Exp.* 26 mill.

809*a*. CAMADENA POLYSTACTA, Hmpsn., P. Z. S., 1906, p. 494, Plate. 36, f. 7.

♂. Head and thorax dark-brown suffused with greyish; abdomen red-brown suffused with dark greyish brown. Forewing red-brown thickly striated with dark-brown, on terminal area forming numerous annulate spots;

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the costal and inner areas suffused with dark-brown to the medial band ; two indistinct, somewhat irregular dark antemedial lines ; a broad oblique dark medial band before the indistinct postmedial line which is bent outwards below costa, excurved to vein 5, then oblique ; an indistinct subterminal line excurved from costa to vein 5, then oblique. Hindwing red-brown thickly striated with dark-brown, on terminal half forming numerous annulate spots ; a small black discoidal spot and slight medial line excurved between veins 5 and 2 ; the termen strongly excurved at middle.

Habitat.—SIKHIM, Gantok. *Exp.* 32 mill.

LIMACODIDÆ.

817*a*. SCAPELODES TANTULA, Swinh., A. M. N. H. (7), XIV., p. 132 (1904).

,, *dinawa*, Beth-Baker, Nov. Zool., XX, p. 382 (1904).

♂. Head and thorax grey mixed with fulvous, and fuscous ; palpi black at tips ; abdomen fulvous, dorsally mixed with fuscous except at base. Forewing fuscous thickly irrorated with grey, and tinged with fulvous on disk ; a diffused fulvous streak below base of cell ; cilia tinged with fulvous. Hindwing fuscous, the basal and inner areas and veins fulvous ; cilia fulvous mixed with fuscous.

Habitat.—ASSAM, Khàsis ; BRITISH NEW GUINEA, Dinawa. *Exp.* 42 mill.

823*a*. OXYPLAX FULVATA, n. sp. (Plate F., f. 16).

♂. Antennæ much thickened and flattened, simple ; metathorax with spreading crest of scales ; forewing with the inner margin lobed before middle and with tuft of scales.

Head and thorax fulvous mixed with some blackish ; abdomen fuscous. Forewing fulvous with a cupreous tinge and brown suffusion ; the basal area suffused with dark brown to the obliquely curved diffused medial line ; the terminal area suffused with black, broadly at costa and narrowing towards tornus ; cilia chequered fulvous and black and with black tips. Hindwing fuscous, cilia grey, fuscous at base and with fuscous line through them.

Habitat—CEYLON, Maskeliya (Pole). *Exp.* 18 mill. Type in B. M.

835*b*. THOSEA FLAVICEPS, n. sp.

Male with the palpi extending about length of head, female about three times length of head.

Head and thorax yellow with slight rufous dorsal streak, the terminal half of thorax suffused with rufous ; pectus, legs and abdomen rufous slightly mixed with yellowish. Forewing deep rufous, the area beyond the postmedial line browner to submedian fold ; some silvery suffusion on median nervure and vein 1, on terminal half of costal area, and on terminal area : an indistinct very oblique brown postmedial line from costa just before apex to middle of submedian fold ; an indistinct somewhat oblique brown subterminal line. Hindwing red-brown with a slight pinkish tinge.

Habitat.—ASSAM, Khàsis (Badgley). *Exp.* ♂ 34, ♀ 40 mill. Type in B. M.

Larva.—With long pointed prominences bearing stinging hair ; solitary : rolls itself up and drops when alarmed ; very dark maroon with fine red and

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yellow lines ; sides green with yellow lines and a series of brown dots ; ventral surface semi-transparent yellow. In the young larva the red and yellow markings on back are absent. Food plants : *Andromeda ovalifolia*, *Photinia eugenifolia* and *Camellia caudata*.

Cocoon.—Oval, slight, dark red-brown.

Pupa.—Short, rounded, light brown with paler rings on dorsum of abdomen, the shoulders shining (Badgley).

836*a*. NATADA FULVIDORSIA, n. sp. (Plate F., f. 9).

♂. Head and thorax fulvous, vertex of head, patagia on outer edge and at extremity with some black scales ; abdomen fuscous brown ; pectus, legs and ventral surface of abdomen pale fulvous. Forewing fuscous brown slightly tinged in parts with grey ; a few fulvous scales below costa and on medial area below the cell. Hindwing fuscous brown ; both wings with fine pale line at base.

Habitat.—CEYLON, Maskeliya (de Mowbray). *Exp.* 26 mill.

836*b*. NATADA FULVIMIXTA, n. sp. (Plate F., f. 21).

♂. Head and thorax dark brown mixed with pale fulvous ; antennæ whitish ; abdomen fuscous brown ; pectus, legs and ventral surface of abdomen ochreous. Forewing dark brown slightly irrorated with greyish and faintly tinged with fulvous in parts ; an oblique whitish line defined by black on inner side from just below apex to inner margin beyond middle. Hindwing fuscous brown ; both wings with fine pale line at base of cilia.

Habitat.—CEYLON, Paltipolla (Alston). *Exp.* 30 mill.

847*a*. TETRAPHLEPS FERREOGRISEA, n. sp. (Plate F., f. 10).

♂. Head, thorax and abdomen iron-grey mixed with black-brown especially at tips of tegulæ and patagia. Forewing iron-grey irrorated with black-brown ; an oblique black subbasal line, arising below costa and bent outwards to inner margin, emitting a streak below the cell to the oblique sinuous black antemedial line ; a black discoidal lunule ; a brown shade from below end of cell to tornus ; an incurved black line from costa towards apex to termen at vein 2, and a black shade on terminal area from just below apex to vein 4 ; cilia chequered grey and black-brown. Hindwing grey suffused with brown.

Habitat.—CEYLON, Mankulam (Mackwood). *Exp.* 24 mill. Type in B. M.

853*a*. MIRESA THERMISTIS, n. sp.

Forewing with vein 10 from well before end of cell.

Head and thorax bright rufous, the vertex of head and tegulæ yellowish ; pectus and legs with some yellowish hair ; abdomen deep rufous with some yellowish hair at base and on ventral surface. Forewing bright rufous, the interspaces of discal area thinly scaled ; a diffused brownish patch beyond end of cell and a faint curved postmedial line. Hindwing rufous tinged with brown.

Habitat.—ASSAM, Khàsis (Badgley). *Exp.* 24 mill. Type in B.M.

Larva.—Slug-like with short stinging hairs ; head retractile, usually concealed under collar when feeding, the hairs from small prominences ; gregari-

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ous ; green with a blue dorsal stripe-edged by fine black lines ; two small black dots on the neck and four black spots at anal extremity ; ventral surface semi-transparent green. Food plant : *Bucklandia populnea.*

Cocoon.—Oval, slight, fastened to the ground and covered by a slight semi-transparent grey papery cover.

Pupa.—Rounded, pale brown (Badgley).

853 *b.* MIRESA PYRONOTA, n. sp. (Pl. F., f. 22).

♂. Head and thorax fiery red with a few red-brown scales mixed ; palpi dark at sides ; pectus and legs more rufous ; abdomen yellow slightly tinged with red and with rufous dorsal patch at base. Forewing rufous with a slight silvery gloss, some fiery red and yellow on basal half of inner margin ; some silver scales at upper angle of cell and a triangular silver spot just beyond lower angle ; a postmedial series of silver points on the veins, oblique below vein 7 ; the terminal area with slight silvery irroration. Hindwing yellow tinged with red and with a slight silvery gloss.

Habitat.—CEYLON, Trincomali (Green). *Exp.* 38 mill. Type in B. M.

855 *a.* MIRESA METATHERMISTIS, n. sp. (Pl. F., f. 6).

♂. Head and tegulæ yellow, the palpi except at tips and antennæ rufous ; thorax and abdomen yellow suffused with rufous, the metathorax with deep rufous tuft of hair. Forewing bright rufous, the basal half of inner area yellowish ; an indistinct deep rufous discoidal spot with a few silvery scales on it ; postmedial line deep rufous with silvery white scales on and before it and silvery white spots on it in submedian interspace and on inner margin, oblique from vein 6 to middle of inner margin ; a slight rufous terminal line ; cilia yellowish at base deep rufous at tips. Hindwing silky rufous, the cilia yellowish at base.

Habitat.—BOMBAY, Kanara, Karwar (T. R. Bell). *Exp.* 30 mill.

Larva.—Food plant : *Blachia.*

856 *b.* MIRESA PHOCEA, n. sp. (Pl. F., f. 5).

Antennæ of male bipectinate with short branches to apex.

♂. Head, thorax and abdomen very dark brown, the hairs slightly tipped with grey ; tarsi pale below. Forewing very dark brown with a leaden grey gloss, the scaling of medial and postmedial areas except towards costa ribbed like seal-skin ; a very oblique grey line defined on inner side by blackish from middle of costa to inner margin before middle ; an elliptical blackish discoidal spot ; an obscure diffused dark subterminal line from costa to termen at vein 2, angled outwards below costa, then incurved. Hindwing dark glossy red-brown.

Habitat.—CEYLON, Trincomali (Green). *Exp.* 32 mill. Type in B. M.

862 *a.* PARASA METATHERMES, n. sp. (Pl. F., f. 4).

♂. Head, thorax and abdomen chocolate brown ; patches on back of head, tegulæ except at middle and sides and patagia except outer edges bright grass-green. Forewing with the basal area chocolate brown, its outer edge angled outwards at median nervure and vein 1 and with slight yellowish line ;

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medial area bright green ; the terminal area pale chocolate brown with darker curved line on its inner edge, slightly incurved in submedian interspace Hindwing pale chocolate brown.

Habitat.—CEYLON, Ohiya (de Mowbray). *Exp.* 28 mill. Type in B. M.

Genus. EPIPYROPS.

Epipyrops, Westw., Proc. and Trans. Ent. Soc., 1876, pp. xxiv and 522 ..... *Type anamola.*

Proboscis absent ; palpi extremely minute ; frons smooth ; eyes large antennæ bipectinate with long branches in both sexes ; tibiæ without spurs. Forewing with the apex somewhat produced and acute, the termen evenly curved ; vein 3 from before angle of cell ; 4·5 from angle ; 6·7·8·9·10·11 from cell. Hindwing with vein 3 from before angle of cell, 5 from above angle ; 6 from below upper angle.

The larvæ and pupæ are covered with masses of floculent white waxy secretion.

873*a*. EPIPYROPS POLIOGRAPHA, n. sp. (Pl. F., f. 12).

♀. Head, thorax and abdomen very dark olive brown mixed with grey. Forewing very dark olive brown thickly and evenly reticulated with indistinct silvery grey markings.

Hindwing uniform very dark olive brown.

Habitat.—CEYLON, Mankulam (Mackwood), Yatiyantota (Green). *Exp.* 16-26 mill. Type in B. M.

879*a*. CERATONEMA FUSCA, Swinh., A M. N. H (7), XV., p. 498 (1905).

Head rufous suffused with fuscous ; thorax and abdomen ochreous tinged with rufous. Forewing rufous, the costal half suffused with purplish fuscous to the postmedial line ; the terminal area pale ochreous tinged with rufous and irrorated with large fuscous scales ; the postmedial line diffused incurved at discal fold and more strongly at submedian ; cilia pale at base, dark at tips. Hindwing pale ochreous.

Habitat.—SIKHIM ; ASSAM, Khàsis. *Exp.* ♂ 22, ♀ 26 mill.

880*b*. CERATONEMA CAUSTIPLAGA, n. sp.

♀. Head and thorax deep chestnut-red glossed with silvery scales : abdomen pale red-brown. Forewing chestnut-brown suffused with purplish silvery scales ; a bright chestnut-red patch between veins 5 and 2 with an oblique band from its inner edge to inner margin ; a chestnut-red apical patch Hindwing red-brown, the cilia greyer with a brown line near base.

Habitat.—ASSAM, Khàsis (Badgley). *Exp.* 28-34 mill. Type in B.M.

Larva.—With long spines bearing stinging hairs ; pale yellow green with diagonal yellowish marks at sides ; a blue-edged white dorsal line with an orange-red band on each side of it ; the anterior spines and the spines on shoulders and tail pink, with two black dots between the pair on shoulders ; hairs on spines black with yellow tips or yellow with black tips. Food plants : *Andromeda ovalifolia, Euryja japonica, Viburnum punctatum* and *Simlax ovalifolia*.

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Cocoon.—On a leaf under rubbish, oval, dull purplish mottled with grey-brown, fastened to leaf by some fluffy pale brown silk.

Pupa.—Short, blunt at both ends, pale brown (Badgley).

881*a*. ARÆOGYIA PHÆOPASTA, Hmpsn., P.Z.S., 1906, p. 492, Pl. 36, f. 22.

Forewing with veins 7, 8, 9, 10 stalked; fore and mid tibiæ, the 1st joint of fore tarsi and the 1st two joints of mid and hind tarsi fringed with long scales.

♂. Head and thorax grey irrorated with dark brown, the tufts of scales on the legs black; abdomen ochreous tinged with rufous. Forewing ochreous thickly irrorated with dark brown leaving an indistinct oblique ochreous line from lower angle of cell to inner margin, an elliptical spot between basis of veins 5·4, some ochreous on costa towards apex and on termen from vein 5 to tornus; cilia fuscous with an ochreous line at base. Hindwing uniform silky brown; cilia ochreous at base, brown at tips.

Habitat.—SIKHIM, Darjiling (Atkinson), Gantok. *Exp.* 22 mill.

888*a*. ALTHA PERALBA, Swinh., Trans. Ent. Soc. 1904, p. 153.

♀. White; patagia at extremity, pectus and forelegs in front, abdomen at base and extremity and on ventral surface irrorated with brown and black. Forewing with the basal area irrorated with black, a slight streak of scales on extremity of median nervure and some diffused scales on apical area.

Habitat.—BOMBAY, Poona. *Exp.* 26 mill.

894*a*. BELIPPA CYANOPASTA, n.sp.

Hindwing with veins 6·7 strongly stalked.

♀. Head and thorax rufous with some silvery blue scales on outer edge of patagia and sides of thorax; abdomen rufous with some silvery blue scales. Forewing rufous, the basal area and terminal half except towards costa irrorated with dark brown and silvery blue scales; numerous waved striæ of raised scales; traces of diffused rufous antemedial and medial bands; a diffused blackish streak from upper angle of cell to the rufous subterminal band which is oblique towards costa, incurved at discal fold, then with some blackish triangular marks before it. Hindwing dark reddish brown.

Habitat.—BURMA, Bhámo (Fea). *Exp.* 34 mill.

LASIOCAMPIDÆ.

910 *a*. METANASTRIA VITTA, Moore, Lep. E.I.C. p. 424, Pl. xii. *a*, f. 4 (1859.)

Bright brick-red with slight greyish irroration; abdomen rather more ochreous. Forewing with indistinct dark antemedial line angled in submedian fold, then oblique; a small discoidal white spot defined by fuscous; an indistinct dark minutely waved postmedial line, angled outwards at vein 7 and oblique below vein 2; a minutely dentate subterminal line angled outwards at veins 4·3; termen tinged with fuscous. Hindwing with traces of diffused maculate postmedial band angled outwards between veins 4·3.

Habitat.—BENGAL, Calcutta; BORNEO, Kuching; JAVA. *Exp.* ♂ 40, ♀ 54 mill.

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Genus CHROSTOGASTRIA.

Type

Chrostogastria, Hübn. Verz., p. 189 (1827)..... ..... *pruni.*

Proboscis absent ; palpi porrect to well beyond frons and thickly clothed with hair ; frons with tuft of hair ; eyes small, hairy ; antennæ of male pectinate to apex with long decumbent branches, the basal joint with tuft of hair, of female with shorter branches; head, thorax and abdomen clothed with woolly hair, the tibiæ and tarsi fringed with long hair on outer side, the tibiæ with terminal pairs of small spurs. Forewing with the costa highly arched towards apex, the termen rather oblique and strongly crenulate ; vein 3 from long before angle of cell ; 4·5 from angle ; 6·7 stalked ; 8 from angle, 9·10 stalked; 11 approximated to 12 towards costa. Hindwing with the costa strongly lobed at base ; the termen crenulate; vein 3 from close to angle of cell ; 4·5 hardly stalked; 7 from long before angle of cell, bent upwards and touching 8 at a point.

922*a*. CHROSTOGASTRIA PRUNI, Linn. Syst. Nat., p. 498 (1758) ; Esp. Schmett, III, p. 72, Pl. 10. Hübn. Eur. Schmett. Bomb., f. 186. Godt. Lèp. Fr., IV, p. 87, Pl. 8, ff. 3·4. Staud. Cat. Lèp. pal., p. 124.

Odonestis prunoides, Staud. Cat. Lep. pal., p. 69 (1872).

Orange yellow suffused with red ; antennæ with the branches brown. Forewing irrorated and suffused with red ; an indistinct antemedial line, oblique below the cell ; a rounded silvery white discoidal spot ; a prominent very obliquely curved postmedial line, approximated at inner margin to the antemedial line ; a rather diffused red subterminal line, slightly dentate at the veins, incurved between veins 6 and 4. Hindwing with traces of irregular postmedial line, the area beyond it usually yellower.

Habitat.—EUROPE ; ASIA MINOR, Bithynia ; E. SIBERIA, Ussuri ; JAPAN ; W. CHINA ; ASSAM, Khásis, Jaintia Hills. *Exp.* 46—76 mill.

Larva.—Kirby, Butt. and Moths, Eur., p. 137.

Bluish grey spotted with whitish and with the lines yellow, the 3rd somite with red dorsal band ; the 12th somite with dorsal hump defined by reddish ; stigmata ringed with black. Food plants various forest and fruit trees 9·5.

929. ALAMPRA FERRUGINEA, insert (syn.) *Taragama indicus*, Conte. Rapp. Lab. Ét. Soie XIII. p. 24, Pl. vi., f. 1 (1909).

The hindwing of male has the termen squarely truncate, the figure represents a female, not a male.

951*a*. GASTROPACHA KHASIANA, Swinh., A.M.N.H. (7), XV., p. 499 (1905).

♂. Head and thorax rufous mixed with whitish ; abdomen ochreous white tinged with rufous. Forewing rufous suffused with whitish, especially on terminal area which is tinged with ochreous , the lines formed of small rufous lunulate marks ; two antemedial lines; a black discoidal point ; two postmedial lines, bent inwards and diverging towards costa, then oblique, with another line beyond them from costa to vein 6; a subterminal line bent inwards to costa

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with an oblique striga beyond it from costa to vein 8; a terminal series of ill-defined lunules with the cilia beyond them white. Hindwing with the termen angled at vein 6 and 2, rufous, the terminal half tinged with greyish ochreous; a medial line incurved at discal fold; two less prominent minutely waved postmedial lines incurved at discal fold; cilia white in the excisions; the underside suffused with whitish.

Habitat.—ASSAM, Khásis. *Exp.* 50 mill.

LYMANTRIADÆ.

979*b*. LÆLIA FULVATA, n. sp. (Plate F., f. 29).

♀. Orange fulvous. Forewing with subterminal series of prominent black spots, the spot above vein 6 slightly displaced outwards and those below veins 3 and 2 bent inwards parallel to inner margin. Hindwing paler.

Habitat.—CEYLON, Galboda (Mackwood). *Exp.* 52 mill. Type in B. M.

1011*a*. DASYCHIRA DUDGEONI, Swinh., A. M. N. H. (7), XIX, p. 203 (1907).

♂. Head and thorax brown mixed with grey, the metathorax with patch of black scales with a metallic gloss; tarsi whitish fringed with dark brown hair; abdomen pale, dorsally suffused with brown. Forewing dull brown, the inner margin and a patch beyond postmedial line in submedian interspace dull ochreous; sub-basal line black defined by ochreous on outerside, slightly waved, from costa to vein 1; antemedial line indistinctly double, the inner line black in submedian interspace, waved, with some black irroration before it, filled in with greenish white and with greenish irroration beyond it except on inner area; a slight whitish lunule at lower angle of cell; postmedial line blackish, oblique from costa to vein 7, then dentate, very oblique and defined by ochreous lunules on inner side below vein 3; a series of minute indistinct ochreous dentate marks from costa to vein 3, bent inwards to costa, before the subterminal series of slight dark lunules on faint ochreous spots. Hindwing uniform dull grey-brown; the underside ochreous whitish suffused with brown, an indistinct curved postmedial line from costa to vein 5 and traces of a diffused subterminal line.

Habitat.—SIKHIM. *Exp.* 40 mill.

1011*b*. DASYCHIRA CYMATA, Swinh., A. M. N. H. (7), XIX, p. 204 (1907).

♂. Head and thorax reddish brown mixed with grey; forelegs blackish brown, the pectus behind and mid and hind legs paler; abdomen reddish brown. Forewing reddish brown suffused with fuscous and irrorated with black and some grey; a small sub-basal whitish spot defined by black scales below the cell; antemedial line rather indistinct, blackish, highly waved, with whitish points before and beyond it in submedian fold; a pale discoidal lunule defined by black; postmedial line blackish, excurved from just below costa to vein 4, then waved; traces of a pale waved subterminal line crossed by short black streaks in the interspaces between veins 8 and 5. Hindwing uniform pale greyish brown; the underside brownish white with traces of a diffused curved brownish postmedial band.

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Habitat.—SIKHIM. *Exp.* 40 mill.

1036*a*. LYMANTRIA POSTFUSCA, Swinh., A. M. N. H. (7), XVII, p. 546 (1906).

♂. Head and thorax white ; palpi and antennæ black ; tegulæ and patagia edged with black ; pectus yellow and black ; legs black with some white spots; abdomen yellow with dorsal and sublateral series of black spots, the anal tuft black. Forewing white with subbasal black band from costa to submedian fold, angle outwards in cell, a point beyond it above vein 1 and oblique striga above inner margin ; a waved antemedial line expanding into a spot on costa; excurved at median nervure, then incurved ; a small spot in middle of cell and discoidal spot ; two dentate postmedial lines, bent outwards below costa, incurved at discal fold and below vein 5 ; a dentate subterminal line ; a terminal series of black lunules. Hindwing whitish suffused with fuscous, leaving a whitish postmedial patch between veins 4 and 2 and a streak in submedian fold ; a lunulate white terminal band from below apex to vein 2 with black points on termen.

♀. Forewing with the subbasal marks above and below vein 2 absent, the antemedial and two postmedial lines conjoined by two streaks below cell and a patch on inner margin. Hindwing whitish, the basal area tinged with yellow ; a broad terminal blackish band with sinuous inner edge and some white spots on termen.

Habitat.— CEYLON, Kandy. *Exp.* ♂ 48, ♀ 64 mill.

1098*a*. EUPROCTIS XANTHOCEPS, n. sp. (Plate F., f. 31).

♂. Head and legs pale yellow ; antennæ whitish with rufous branches ; thorax and abdomen red-brown with a greyish tinge. Forewing uniform red-brown, the cilia pale at tips. Hindwing fuscous brown, the cilia pale at tips. Underside of forewing with the costa yellowish.

Habitat.—CEYLON, Haldamulla (Mackwood). *Exp.* 24 mill. Type in B. M.

1105*a*. EUPROCTIS DIPLAGA, n. sp.

♂. Head, thorax and abdomen chocolate brown mixed with yellowish; the pectus, legs and ventral surface of abdomen yellow. Forewing yellowish, almost wholly suffused with chocolate brown ; a large quadrate antemedial deep chocolate patch defined by yellowish white from cell to vein 1 and followed by the curved brown antemedial line ; a brown postmedial line excurved from costa to vein 6, then dentate and oblique to submedian fold ; an elliptical deep chocolate patch from vein 7 to below vein 6 before the subterminal line which is whitish and excurved round its outer edge, then indistinct, brown, waved, oblique ; a slight yellowish terminal line with small brown spots before it from apex to vein 4. Hindwing dark chocolate brown with the base and costa to beyond middle orange-yellow ; cilia yellow at tips ; the underside orange-yellow with the terminal area suffused with chocolate brown.

Habitat.—ASSAM, Khásis (Badgley). *Exp.* 24 mill. Type in B. M.

Eggs.—Spheroidal ; smooth, shining pale dull green ; laid in lines with dark dull greenish-grey hair.

Larva.—Solitary ; cylindrical ; pubescent with a few long grey hairs ; black

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with five yellow rings ; collar red ; two red tubercles near tail ; ventral surface dark olive-grey ; head black, small, retractile. Food plant : *Schima Wallichii.*

Cocoon.—Oval, silken, strong, grey, clustered together in a shallow hollow of bark of tree stem.

Pupa.—Entire, naked, dark brown, with a spike at tail (Badgley).

1116*a*. LEUCOMA THYRIDOPTERA, n. sp. (Plate F., f. 3).

♀. White. Forewing hyaline except marginal areas ; the costal and inner areas slightly tinged with fuscous ; four irregular oblique lines of raised scales on antemedial area ; a discoidal patch of white scales with some striæ beyond it ; the terminal band with its inner edge angled inwards above veins 5·2·1, with striæ of raised scales on it and ill-defined fuscous subterminal line. Hindwing hyaline except inner and terminal areas ; an antemedial patch of scales from middle of cell to inner area ; a discoidal lunule ; the terminal band with its inner edge angled inwards above veins 5 and 2 and with a diffused fuscous subterminal line on it.

Habitat.—CEYLON, Hibarama (Mackwood). *Exp.* 48 mill. Type in B. M.

1125. CISPIA PUNCTIFASCIA.

In the typical form from N. India the orange band of forewing extends to the costa and inner margin.

Subsp. 1. Forewing with the orange band extending from upper angle of cell to vein 1 only.

Habitat.—CEYLON, low country, N. Central Province (Pole), Anaradpura, Kandy (Green).

Subsp. 2. Larger and darker ; abdomen with the dorsal and lateral black spots much more developed ; hindwing with the curved medial band much more developed, the terminal area tinged with rufous, leaving yellow streaks on the veins.

Habitat.—CEYLON, Hill country, Maskeliya (Pole, de Mowbray). *Exp.* ♂ 62. ♀ 76 mill

ARCTIADÆ.

NOLINÆ.

1529*a*. CELAMA LEUCOSCOPULA, Hmpsn., A. M. N. H. (7), XIX, p. 227 (1907). (Plate G., f. 2.)

Head, thorax and abdomen white, slightly tinged with pale rufous ; anal tuft pure white. Forewing white, tinged in parts with pale brown ; antemedial line black, strong, angled outwards in cell, then oblique, with brownish suffusion before it ; medial and postmedial oblique elliptical patches from costa ; postmedial line very ill-defined, bent outwards below costa, then oblique ; traces of a sinuous subterminal line. Hindwing white, slightly tinged with brown and with faint discoidal spot.

Habitat.—CEYLON, Ambalangoda, Peradeniya, Matale, Pattalam, Hambantota. *Exp.* 12 mill.

1530*d*. CELAMA MESOTHERMA, Hmpsn., A. M. N. H. (8), IV, p. 349 (1909). (Plate G., f. 3).

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Head, thorax and abdomen white, tinged with rufous ; palpi with the scales fringing the joints tipped with black ; tibiæ and tarsi ringed with blackish. Forewing white, irrorated with rufous and some fuscous ; a subbasal black point on costa ; antemedial line brown defined on inner side by white, angled outward below costa, then oblique ; medial area suffused with rufous, the tufts of scales at middle and upper angle of cell dark with oblique elliptical brownish stigmata above them from costa ; postmedial line blackish and somewhat punctiform, defined on outer side by white, slightly bent outwards below costa, oblique to vein 4, then incurved and again excurved above inner margin ; subterminal line white, defined on inner side by blackish scales with rufous suffusion before them, angled outwards at vein 7, excurved at middle, and ending at tornus ; a punctiform dark terminal line ; cilia white, mixed with some rufous and fuscous. Hindwing white, tinged with ochreous brown, especially towards termen ; cilia white, faintly tinged with brown : the underside white, the costal area irrorated with brown.

Habitat.—CEYLON, Rambakkhana, Colombo ; BORNEO, Sarawak, Sandakan. *Exp.* 14 mill.

1530*e*. CELAMA RUFIMIXTA, Hmpsn., A. M. N. H. (8), IV, p. 350 (1909). (Plate G.,f.4).

Head and thorax white ; palpi rufous ; antennæ tinged with rufous : thorax with some rufous behind tegulæ ; tarsi rufous ringed with white : abdomen white, tinged with rufous. Forewing white, with some blackish irroration on basal area and before postmedial line ; antemedial, medial and postmedial rufous patches on costa ; the terminal area suffused with rufous except at apex ; antemedial line white, defined on inner side by rufous and on outer by black from cell to inner margin, excurved in submedian interspace ; large tufts of rufous and white scales in middle and end of cell ; an indistinct oblique waved line from lower angle of cell to inner margin ; postmedial line white, defined on inner side by brown, slightly bent outwards below costa and incurved below vein 4, subterminal line white, slightly defined on inner side by black scales, excurved below costa, at middle and above inner margin. Hindwing white, the terminal area tinged with brown ; the underside with the costal area irrorated with brown, a dark discoidal striga.

Habitat.—CEYLON, Yatiyantota, Matale, Wattegama. *Exp.* 18 mill.

1530*f*. CELAMA DENTILINEA, Hmpsn., A. M. N. H. (8), IV, p. 350 (1909). (Plate G.,f.5).

♀. Head, thorax and abdomen white, tinged with ochreous brown ; fore tibiæ and the tarsi fuscous brown ringed with ochreous white. Forewing white, tinged with ochreous brown and slightly irrorated with fuscous ; antemedial line blackish defined on inner side by white, curved, angled outwards in submedian fold ; the tufts of scales at middle and upper angle of cell dark, with oblique elliptical brownish stigmata above them from costa ; a waved dark line from lower angle of cell to inner margin ; postmedial line

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blackish, punctiform, oblique from costa to vein 6, then inwardly oblique; terminal area suffused with ochreous brown, the subterminal line white; strongly and evenly dentate; a brown terminal line; cilia white, tinged with ochreous brown. Hindwing white, the costal area tinged with ochreous brown.

Habitat.—CEYLON. *Exp.* 18 mill.

1534. RASELIA NEGRITA, insert (syn.) 1407*a*. *Galleridia fuscizonea.*

1539*b*. RŒSELIA PALLIDICEPS, Hmpsn., A. M. N. H. (7), XIX, p. 229 (1907). (Plate G.,f.6).

♂. Head and tegulæ ochreous white; palpi and lower part of frons black-brown; thorax grey mixed with fuscous; abdomen grey. Forewing grey thickly irrorated with fuscous brown, the terminal half slightly paler; a dark slightly curved medial line; a black discoidal bar, the postmedial line conjoined to its upper and lower extremities and excurved beyond cell, an ill-defined line from costa beyond it, joining the subterminal line at vein 4 and with a dark striga from costa between them; the subterminal line ill-defined, slightly angled outwards at vein 7 and inwards at vein 2. Hindwing grey thickly irrorated with fuscous; cilia with a fine pale line at base.

Habitat—CEYLON. *Exp.* 14 mill.

1543*b*. ZIA ECTROCTA, Hmpsn., A. M. N. H. (7), XIX, p. 229 (1907). (Plate G.,f.7).

♂. Head and thorax white; legs blackish, the tarsi ringed with white; abdomen white, tinged with fuscous. Forewing pure white; a small black spot on costa near base; a medial triangular black patch from costa to origin of vein 2, its outer edge excised in cell; two small discoidal tufts of raised scales with a few dark scales round them; postmedial line black, with small tufts of raised metallic scales on it, oblique and obsolescent from costa to vein 6, slightly incurved at discal fold and strongly below vein 4, the area beyond it rufous except at apex; subterminal line represented by a dark point on costa, then on the rufous area white defined on inner side by black from below apex to vein 3, excurved below vein 7 and at middle, and below vein 2 angled inwards to near postmedial line; cilia rufous, intersected with white. Hindwing white, the terminal area slightly tinged with brown from apex to vein 3.

ab. 1. Forewing with the postmedial line more angled inwards below vein 4 and with large black patches beyond it on inner area and at middle, the latter connected with the termen below apex by an oblique black fascia.

Habitat.—CEYLON, Haputale, Maskeliya. *Exp.* 20-24 mill.

LITHOSIANÆ.

1340*a*. ILEMA ATRIFRONS, Hmpsn., A. M. N. H. (7), XIX, p. 231 (1907) (Plate G., f. 8.)

♂. Head, tegulæ, patagia, pectus and legs fulvous yellow; palpi, frons and forelegs in front fuscous; dorsum of thorax and base of abdomen grey

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white, the rest of abdomen yellow. Forewing yellow with a whitish suffusion. Hindwing whitish yellow.

Habitat.—NICOBARS. *Exp.* 26 mill.

1386*c*. HALONE FLAVINIGRA, Hmpsn., A. M. N. H. (7), XIX., p. 232 (1907). (Plate G., f. 9.)

♂. Head, thorax and abdomen fuscous, the vertex of head, base of shaft of antennæ, and tegulæ yellow. Forewing orange yellow ; a black patch at base with irregular oblique outer edge ; a postmedial black band angled inwards below cell and with rather dentate edges ; some diffused fuscous before termen. Hindwing pale fuscous.

Habitat.—S. INDIA, Palni Hills, 6,000′. *Exp.* 20 mill.

1402*b*. EUGOA CRASSA, Wlk., Journ. Linn. Soc. Zool., VI, p. 114 (1862); Hmpsn., Cat. Lep. Phal. B. M., II., p. 547, Plate 34, f. 28.

Tospitis indeclaratana, Wlk., XXVIII, 427 (1863).

Tospitis inconspicua, Wlk., XXVIII, 430 (1863).

♂. Head and tegulæ pale yellow ; palpi and lower part of frons blackish ; thorax brown ; abdomen yellowish. Forewing yellowish, thickly irrorated and suffused with reddish brown ; a rather darker patch at base of costa ; a minute black point at lower angle of cell ; faint traces of an oblique band from costa near apex. Hindwing pale yellow.

♀. Hindwing pale brown, the cilia pale yellow.

ab. 1. *inconspicua*. Frons blackish ; forewing with the patch on base of costa more prominent ; the oblique postmedial band more prominent.

Habitat—ASSAM, Khásis ; BORNEO, Sarawak. *Exp.* 20-22 mill.

1424*b*. MILTOCHRISTA OCELLATA, Hmpsn., A. M. N. H. (7), XIX, p. 234 (1907). (Plate F., f. 32.)

♀. Head and thorax orange-yellow; patagia and prothorax with black spots, tibiæ banded with black, last joint of tarsi black ; abdomen greyish ochreous, the ventral surface blackish. Forewing orange yellow ; small black spots at base of costa and cell ; fuscous spots below costa and cell and above vein 1 before the antemedial line which is interrupted at submedian fold and angled inwards above inner margin ; a large annulus at end of cell ; postmedial line strongly bent outwards below costa, then highly and irregularly dentate, strongly incurved below vein 4 and conjoined to antemedial line above and below submedian fold ; a subterminal series of small spots on the veins. Hindwing yellow.

Habitat.—CEYLON, Ohiya. *Exp.* 40 mill.

1461*d*. ASURA PHANTASMA, Hmpsn., A. M. N. H. (7), XIX. p. 233 (1907). (Plate G., f. 10.)

♂. Whitish ochreous ; antennæ and forelegs in front fuscous. Forewing with the base of costa black ; a small black spot in base of cell ; an indistinct antemedial series of spots strongly excurved in cell and less so below it, sometimes almost conjoined into a line ; a medial line oblique from costa to subcostal nervure, then excurved, often almost obsolete ; a small discoidal spot;

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a postmedial series of points, sometimes almost obsolete, those on veins 6 and 4 nearer termen; one or two points on termen sometimes present. Hindwing pale ochreous, the apex sometimes faintly tinged with fuscous.

Habitat.—ANDAMANS. *Exp.* 18 mill.

1462*a*. ASURA TOXODES, Hmpsn., A. M. N. H. (7), XIX., p. 233 (1907). (Plate G., f. 11.)

♂ Head and thorax pale ochreous slightly mixed with fuscous; antennæ and extremities of tibiæ fuscous; abdomen ochreous white. Forewing pale ochreous, the costal edge blackish on basal and terminal areas; a black point in base of cell; some fuscous in submedian fold; a highly curved antemedial line; a medial line angled inwards in cell; postmedial line confluent at costa and inner margin with the medial line with which it forms a bow-shaped mark, very oblique from costa to vein 6 and from vein 4 to inner margin; a very irregular subterminal line, angled outwards at veins 6 and 4; a fine black terminal line Hindwing pale semi-hyaline ochreous.

Habitat.—ANDAMANS, *Exp.* 24 mill.

1481*a*. ASURA FULVIMARGINATA, Hmpsn., A. M. N. H. (8), IV, p. 357 (190°). (Plate G., f. 12.)

♀. Head, tegulæ and patagia orange yellow; the vertex of head with slight dark streak; antennæ brown; thorax and abdomen pale brown, the hind tibiæ and tarsi yellowish. Forewing pale red-brown, the costal and inner margins reddish yellow. Hindwing pale semi-hyaline red-brown.

Habitat.—MADRAS, Horsleykonda. *Exp.* 26 mill.

1485*a*. NEASURA TAPROBANA, Hmpsn., A. M. N. H. (7) XIX, p. 232 (1907). (Plate G., f. 13.)

♂. Ochreous yellow; antennæ at tips, forelegs in front and extremities of mid and hind tibiæ fuscous. Forewing with black point in base of cell; the costa fuscous to the curved diffused antemedial line; a blackish discoidal point on some fuscous suffusion; postmedial line very diffused and ill-defined, waved, omitting streaks inwards on the veins and outwards on veins 7·6·4. Hindwing, with slight fuscous suffusion below apex.

Habitat.—CEYLON, Maskeliya. *Exp.* 24 mill.

ARCTIANÆ.

1175*a*. DIACRISIA ALBICORNIS.

♀. Head and thorax dull brown; antennæ black; pectus, legs, except femora above, and ventral surface of abdomen brown. Forewing uniform dull brown. Hindwing brown, suffused with scarlet; a black discoidal spot; Underside brown, suffused with scarlet; forewing with slight discoidal lunule; hindwing with black discoidal spot.

Habitat.—CEYLON, Haldamulla (Mackwood). *Exp.* 50 mill.

Genus PREPARCTIA.

Preparctia, Hmpsn., Cat. Lep. Phal. B. M. III, p. 219 (1901) *Type mirifica.* Proboscis fully developed; palpi porrect, extending about the length of

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head ; antennæ of female serrate ; tibiæ with the spurs moderate. Forewing with vein 3 from before angle of cell ; 4·5 from angle ; 6 from upper angle ; 7·8·9·10 stalked ; 11 from cell. Hindwing with veins 3 and 5 from close to angle of cell ; 6·7 from upper angle ; 8 from middle of cell.

1243*a*. PREPARCTIA HANNYNGTONI, n. sp. (Plate F., f. 34.).

♀. Head black ; tegulæ yellow ; thorax black with white streaks at sides and small crimson spots behind tegulæ ; coxæ crimson, the femora and base of hind tibiæ above with crimson streaks ; abdomen crimson with dorsal series of black bars, the ventral surface black with series of slight crimson bars. Forewing black ; a subbasal creamy white striga from costa and antemedial bar both connected with a streak on median nervure from base to origin of vein 2, dilated and enclosing a slight black streak below the antemedial bar and met at origin of vein 2 by a down curved streak from base in submedian interspace ; a creamy white striga from middle of costa ; a curved band from costa beyond middle to lower angle of cell where it is produced outwards to a point, the band giving off an oblique bar from its outer edge below costa ; postmedial line creamy white, excurved from costa to vein 4, then oblique and slightly sinuous ; a narrow creamy white subterminal band, excurved from costa to vein 5, slightly incurved at vein 3, and at submedian fold, forming a wedge-shaped patch connected with the postmedial line ; the cilia and the inner margin narrowly creamy white. Hindwing crimson ; an oblique black band from costa before middle to vein 1 ; a large discoidal lunule and spot above it on costa ; postmedial band black, obliquely curved from below costa where it arises, to vein 1 where it terminates in a quadrate patch connected with the medial band, with which it is also connected by a wedge-shaped patch at vein 2 ; subterminal band black, curved, from costa to submedian fold, dilated at discal fold and vein 2 ; a triangular patch above tornus ; a fine black terminal line from apex to vein 2 ; cilia yellow ; the underside with the costal area yellow.

Habitat.—KUMAON, Niti Pass, 10,000′ (*Hannyngton*). *Exp.* 58 mill. Type in B.M.

1279*b*. UTETHEISA PULCHELLOIDES, Hmpsn., A. M. N. H. (7), XIX, p. 239 (1907). (Plate G., f. 19).

Differs from *U. pulchella* in the antennæ of male being serrate instead of ciliated and in the hindwing having a fold and tuft on inner area.

It varies much in the same way as *U. pulchella* but never seems to lose the black spots of forewing which usually has the ground colour rather white ; in specimens from the New Hebrides and Solomons the black terminal band on hindwing is largely developed. It appears to be confined to Oceanic and other Islands and to N. Australia.

Habitat.—SEYCHELLES ; CARGADOS CAREJOZ ; COETIVY ; AMIRANTES ; CHAGOS IS. ; CEYLON, Kandy, Peradenyia, Hambantota, Trincomali ; COCOS KEELING IS ; CHRISTMAS IS. ; SINGAPORE ; FORMOSA ; LOO-CHOO IS. ; NEW GUINEA ; N. AUSTRALIA ; QUEENSLAND ; SOLOMON IS. ; GILBERT IS. ; MARSHALL IS ; ELLICE IS. *Exp.* 34-44 mill.

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NOCTUIDÆ.

AGROTINÆ.

For *Ala* Staud.1882 Nec. Lock. Crust. 1877 insert ANARTOMORPHA, Alph. Rom.

Mem. vi., p. 39 (1892) ... ... *Type potanini.*

1669*b*. ANARTOMORPHA FLAVESCENS, Hmpsn., P. Z. S. 1906, p. 486, Plate 36, f. 3.

♂. Head and thorax clothed with black, brown and grey scales and hair; palpi whitish banded with brown; lower part of frons whitish; fore tibiæ and tarsi with white rings; abdomen ochreous white, irrorated with fuscous. Forewing black-brown, suffused with greyish; subbasal line indistinctly double filled in with grey, angled inwards in cell and extending to vein 1; antemedial line indistinctly double filled in with grey, oblique from costa to submedian fold, then erect; claviform moderate, defined by black; orbicular and reniform with brown centres and slight whitish annuli defined by black, the former oblique elliptical, the latter angled inwards on median nervure and touching the former; an indistinct dentate whitish mark below end of cell on vein 2; postmedial line double filled in with greyish, bent outwards below costa, oblique to vein 5 where it is angled, then inwardly oblique and minutely waved; subterminal line whitish, slightly defined by black on outer side, angled outwards at vein 7 and to termen at veins 4-3, incurved at discal and submedian folds; a terminal series of slight black lunules; cilia whitish and brown with a blackish line through them. Hindwing white, strongly tinged with ochreous; the basal area suffused with fuscous; a black discoidal lunule; a terminal fuscous band, rather broad at costa, narrowing to a point at tornus; some black striæ on termen; cilia pure white, the underside ochreous white, the costal area slightly irrorated with fuscous, a slight discoidal lunule and diffused subterminal bands.

Habitat.—SIKHIM, Tungu. *Exp.* 28 mill.

1948*a*. ISOCHLORA METAPHÆA, Hmpsn., P. Z. S. 1906, p. 488, Plate 36, f. 2.

♂. Head and thorax emerald green; palpi and sides of frons purplish red; antennæ fulvous; pectus and legs greyish ochreous, the front of pectus and fore and mid legs in front purplish red; abdomen pale ochreous, the ventral surface suffused with purplish red, the anal tuft fulvous. Forewing emerald green, the costal edge white; cilia white at tips. Hindwing ochreous white, uniformly suffused with pale brown; cilia yellowish white. The underside of forewing pale purplish red, the termen greenish; hindwing brownish white, the costal area tinged with purplish red.

Habitat.—SIKHIM. *Exp.* 42 mill.

1633*b*. EUXOA CONFUSA, Alph. Hor. Ent. Soc., Ross., XVII., p. 61, Plate 2, f. 47 (1882); Staud. Cat. Lep. Pal., p. 136.

Head, thorax and abdomen grey, mixed with brown and fuscous; palpi blackish at sides; tarsi blackish with grey rings. Forewing grey, suffused in

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part with brown and irrorated with fuscous; sub-basal line represented by double black striæ from costa and cell; antemedial line double, oblique, slightly waved, and angled inwards on median nervure; claviform slightly defined by black scales; orbicular and reniform with white annuli defined by black, the former round; postmedial line indistinctly double, slightly bent outwards below costa, then minutely waved, incurved below vein 4, some grey points beyond it on costa; subterminal line indistinct, whitish, defined on inner side by a blackish bar from costa and blackish dentate marks at middle, slightly angled outwards at vein 7; a terminal series of black points; cilia grey with a fuscous line at base. Hindwing grey, uniformly tinged with fuscous brown; cilia white; the underside white, slightly irrorated with brown, a small discoidal spot and indistinct curved postmedial line.

Habitat.—W. TURKISTAN; E. TURKISTAN; MONGOLIA; SIKHIM. *Exp.* 36 mill.

1627*b*. EPISILIA CLAVATA, Hmpsn., A. M. N. H. (7), XIX, p. 244 (1907). (Plate G., f. 20).

Antennæ of male bipectinate with moderate branches; the apical part serrate.

♂. Head, thorax, and abdomen dark reddish brown mixed with grey; tarsi with pale rings. Forewing grey tinged with red-brown, the medial area red-brown except towards costa and inner margin; sub-basal line represented by a black striga from costa; a strong sinuous black streak below base of cell with yellow streak above it to the claviform, which has a yellowish annulus defined by black and intersects the oblique sinuous antemedial line; orbicular and reniform grey with brownish centres and defined by black, the former oblique elliptical, open above, the latter a narrow lunule very strongly angled on median nervure to below orbicular, some blackish in cell before and between them; postmedial line strongly bent outwards below costa, then dentate, strongly incurved below vein 4; subterminal line very indistinct, greyish, slightly angled outwards at vein 7 and excurved at middle, the veins beyond it with slight dark streaks; a terminal series of slight brown lunules; cilia with fine brown line near base. Hindwing grey suffused and irrorated with brown, a dark terminal line: the underside with dark discoidal lunule and diffused curved postmedial line.

Habitat.—PUNJAB, Kulu. *Exp.* 30 mill.

1634*a*. EPISILIA ARENACEA, Hmpsn., A. M. N. H. (7), XIX., p. 245 (1907). (Plate G., f. 21).

Antennæ of male serrate and fasciculate.

♂. Head and thorax pale brownish ochreous, tarsi fuscous with pale rings; abdomen pale ochreous, dorsally irrorated with fuscous. Forewing pale brownish ochreous, slightly irrorated with fuscous; a double waved sub-basal line from costa to submedian fold; antemedial line indistinctly double, oblique, strongly waved, interrupted; orbicular and reniform with slight yellowish annuli incompletely defined by fuscous, the former round, the latter large; postmedial line double at costa, then indistinct, t outward below costa, then dentate and

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produced to a series of black points on the veins, oblique below vein 4, some pale points beyond it on costa; subterminal line ochreous white, slightly defined by fuscous on inner side at costa, then by slight dentate marks, angled outwards at vein 7 and slightly excurved at middle ; a terminal series of black points. Hindwing whitish suffused with pale brown ; cilia yellowish white ; the underside white, the costal area tinged with ochreous, a small discoidal spot and punctiform postmedial line.

Habitat.—BELOOCHISTAN, Quetta. *Exp.* 46 mill.

1632*a*. LYCOPHOTIA POLIOCHROA, Hmpsn., P. Z. S., 1906, p. 489. Plate 36, ff. 16-17.

Antennæ of male strongly serrate and fasciculate.

♂. Head and thorax grey-white mixed with some brown and fuscous ; abdomen ochreous white. Forewing grey and white tinged with ochreous and slightly irrorated with brown ; sub-basal line represented by black striæ from costa and cell ; antemedial line single, black defined by whitish on inner side, interrupted at the veins, erect from costa to vein 1, and angled outwards above inner margin ; claviform moderate, defined by black ; orbicular and reniform defined by rather diffused black, with its inner edge produced inwards as a streak to antemedial line ; traces of a diffused medial line touching orbicular and claviform ; postmedial line single, black slightly defined by whitish on outer side, bent outwards below costa, then dentate and produced to short streaks on the veins, confluent with outer edge of reniform, oblique below vein 4 ; faint traces of a whitish subterminal line slightly defined by fuscous on inner side, excurved at vein 7 and middle ; a terminal series of slight black lunules ; cilia ochreous white with two slight dark lines through them. Hindwing white tinged with pale brown, the cilia pure white ; the underside white with slight discoidal spot and indistinct postmedial line from costa to vein 4.

♀. Wing aborted, small, the forewing elongate, narrow, the termen, rounded, the hindwing triangular ; forewing with the lines browner, the antemedial line excurved below cell and above inner margin ; claviform absent ; orbicular reduced to a point, the reniform a slight lunule well separated from postmedial line ; the subterminal line more distinct and dentate. Hindwing whiter.

Habitat.—TIBET, Kamba Jong ; SIKHIM, Teesta Valley, Lhanak Valley. *Exp.* ♂ 36, ♀ 12 mill.

1632*b*. LYCOPHOTIA POLIADES, Hmpsn., A. M. N. H. (7), XIX., p. 248 (1907). (Plate G., f. 22).

Antennæ of male ciliated ; pro-and meta-thorax with spreading crests.

Head and thorax white with a few fuscous hairs; tarsi banded with black; abdomen white with tufts of long ochreous hairs from lateral stigmata. Forewing grey-white slightly tinged with pale rufous in parts and irrorated with fuscous. the veins with dark streaks ; a slight black streak below base of cell ; sub-basal line represented by black striæ from costa and cell ; antemedial line represented by a black point on costa ; claviform defined by a few black scales ; orbicular

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represented by a short black streak defined by white, the reniform by an undefined white lunule with fuscous spot at lower angle of cell; medial and postmedial black points on costa with some slight white points beyond them; subterminal line indistinct, whitish defined on inner side by slight dentate rufous marks, angled outward at vein 7 and inwards at discal fold; a terminal series of slight black lunules. Hindwing pure white.

Habitat.—BELOOCHISTAN, Quetta. *Exp.* 36 mill.

Genus METALEPSIS.

Type

Metalepsis, Grote, Check. List. Noct., p. 25 (1875) .....*cornuta.*

Spinipalpa, Alph. Hor. Ent. Soc., Ross., xxvi, p. 444 (1892) .....*maculata.*

Proboscis well developed; palpi oblique, fringed with long hair in front and with some spinous hair mixed; frons smooth; eyes rounded, strongly ciliated; antennæ of male typically pectinated with rather short branches; frons and vertex of head with tufts of hair; thorax clothed with hair; tegulæ forming a dorsal ridge; pro-and meta-thorax with crests; tibiæ strongly spined; abdomen fringed with long hair at sides. Forewing rather narrow, the apex produced; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 shortly stalked; 8 anastomosing with the cell near base only.

Sect. (*Spinipalpa*) Antennæ of male ciliated.

1624*a*. METALEPSIS MACULATA.

Spinipalpa maculata, Alph. Hor. Ent. Soc., Ross., XXVI, p. 445 (1892); id. Bom. Mem., IX, p. 12, plate 1, f. 1; Staud. Cat. Lep. Pal. 154.

Metalepsis aletes, Hmpsn., P. Z. S., 1906, p. 488, plate 36, f. 6.

♂. Head and thorax pale rufous with a few black hairs; patagia with a white fascia edged on each side by black; pectus, legs and abdomen brownish grey, the anal tuft ochreous. Forewing pale rufous, the veins streaked with white and defined on each side by grey; a slight black streak below base of costa; a black streak below base of cell and another above basal half of inner margin; two black streaks in cell, the upper interrupted beyond middle, the lower not reaching lower angle; an obliquely curved postmedial series of wedge-shaped black streaks in the interspaces from above veins 7 to above 1, the streak above vein 5 displaced inwards and the streak above vein 1 longer; a terminal series of wedge-shaped black streaks in the interspaces. Hindwing pale brownish grey.

Habitat.—TIBET; SIKHIM. *Exp.* 30 mill.

Genus UFEUS.

Type

Ufeus, Grote, Bull. Buff. Soc. Nat. Sci., 1, p. 101 (1873) ..... *satyrica*

Proboscis fully developed, palpi short, porrect, clothed with long rough hair; frons smooth; eyes large, overhung by cilia; antennæ of male ciliated;

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head and thorax clothed with rough hair; mid and hind tibiæ spined; abdomen dorsally flattened, the anal tuft large. Forewing rather narrow, the apex rounded; veins 3 and 5 from near angle of cell; 6 from upper angle or from areole; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell, 5 obsolescent from middle of discocellulars; 6·7 from upper angle or shortly stalked.

1654*a*. UFEUS CARNEA, Hmpsn., A. M. N. H. (7), XIX, p. 249 (1907). (Plate G., f. 23.)

♀. Head and thorax pale flesh colour mixed with brown; abdomen pale grey-brown. Forewing pale flesh pink slightly irrorated with fuscous, the medial area (except towards costa) and a patch on costa beyond postmedial line suffused with fuscous; sub-basal line represented by double striæ from costa and cell; antemedial line rather indistinct, waved, incurved to costa and angled inwards on vein 1; claviform minute, defined by blackish; orbicular and reniform pale pinkish defined by fuscous, the former rather oblique elliptical, the latter with some brownish in centre and angled inwards on median nervure; traces of a waved medial line; postmedial line indistinct, bent outwards below costa, then minutely waved, incurved below vein 4, some pale points beyond it on costa; a subterminal series of small dentate black marks, angled outwards at vein 7, then oblique; a terminal series of minute dark points; a fine pale line at base of cilia. Hindwing ochreous suffused with brown; the underside whitish tinged with flesh colour and irrorated with brown, a small discoidal spot and indistinct sinuous postmedial line.

Habitat.—KASHMIR, Narkundah, *Exp.* 44 mill.

Genus ANYTUS.

	Type
Anytus, Grote, Bull. Buff. Soc. Nat. Sci., 1, p. 144 (1873)	*privata*
Fishia, Grote, Can. Ent. IX., p. 21 (1877)	*enthea*

Proboscis fully developed; palpi upturned, reaching vertex of head, the 2nd joint fringed with hair in front; frons smooth, rounded; eyes large, overhung by long cilia; antennæ of male typically ciliated; head and thorax clothed with hair and scales, the pro-thorax with spreading crest, the meta-thorax with ridge-like crest; tibiæ fringed with hair, the mid and hind tibiæ spined; abdomen with slight dorsal crests and rough hair towards base. Forewing with the apex rectangular, the termen crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle or shortly stalked; 8 anastomosing with the cell near base only.

1654*b*. ANYTUS LEUCOCYMA. Hmpsn., A. M. N. H. (7), XIX, p. 250 (1907.) (Plate G., f. 24.)

♀. Head and thorax red-brown mixed with fuscous; frons with lateral black bars; tegulæ with slight medial black line; abdomen grey-brown. Forewing red-brown irrorated with grey and black on basal half, the veins streaked with

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black ; a sinuous black streak below base of cell ; subbasal line absent ; antemedial line represented by two black striæ from costa, then very indistinct, strongly dentate, oblique ; claviform narrow, defined by black and with blackish streak from it to postmedial line ; orbicular defined by black, oblique wedge-shaped ; reniform indistinctly defined by black and with slight whitish lunule on its outer edge, its lower extremity produced ; postmedial line double at costa, bent outwards below costa, then dentate and produced to streaks on the veins, oblique to vein 5, then inwardly oblique and angled inwards in submedian fold, some white points beyond it on costa ; subterminal line white, waved, angled outwards at vein 7 and to termen at veins 4·3, with black streaks beyond it in the interspaces ; a fine waved black terminal line ; cilia greyish and fuscous intersected with white. Hindwing whitish tinged with brown, the veins and terminal area suffused with brown ; traces of a waved white subterminal line ; cilia white with a slight dark line through them ; the underside white irrorated with fuscous, a discoidal spot, slight waved postmedial line and traces of subterminal line.

Habitat.—KASHMIR, Nubra. *Exp.* 50 mill.

(*To be continued.*)

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ORCHIDS OF THE BOMBAY PRESIDENCY.

BY

G. A. GAMMIE, F.L.S.

PART X. (WITH PLATE X.)

(Continued from page 626 of Volume XIX.)

21. SACCOLABIUM.

Epiphytes. *Leaves* two-ranked, leathery, keeled, *peduncles* from lateral axils; *flowers* small, in *spikes*, *sepals* and *petals* adnate to the base of the column, spreading, subsimilar, free; *lip* sessile at the base of the column, spurred, *lateral* and *midlobes* small, *spur* neither septate within nor with calli, *column* short, broad, truncate, rarely beaked, *foot* 0, *anther* one-celled, *pollinia* 2, bipartite.

* *Stems* long and stout, erect, *leaves* rigidly leathery, *flowers* corymbose, *sepals* and *petals* with transverse red bands ..... 1. S. wightianum.

** *Stems* very short, *leaves* few, lax and leathery, *flowers* racemose.

Sepals and *petals* greenish, *midlobe* and *spur* of *lip* white tinged with pink ..... 2. S. viridiflorum.

Sepals and *petals* yellow, each with a purple spot in the centre, *lip* white, tinged with pink ..... 3. S. maculatum.

1. SACCOLABIUM WIGHTIANUM, *Hook., f. Fl. Br. Ind., VI., p. 72* S. præmorsum, *Hook. f. Fl. Br. Ind., VI., p. 62*; S. papillosum, *Dalz. and Gibs. p. 264*; Acampe Wightiana, *Lindl., T. Cooke, Fl. of Bombay, II., p. 705*; *Ærides præmorsum, Grah. Cat., p. 204.*

Stems 12 to 18 inches long, stout, clothed with the sheaths of fallen leaves. *Leaves* strap-shaped, 4 to 8 inches long, irregularly 2-lobed at the apex. *Peduncles* stout, green, 1½ inch long, *bracts* brown, very broadly ovate. *Flowers*, each about ⅔ inch in diameter, crowded, subcorymbose, fragrant, texture thick, *sepals* subequal, ovate-oblong obtuse, slightly keeled on back towards apex, yellow mottled with brown on the outer surface, the inner surface yellow with irregular, reddish brown, transverse bands, *petals* similar in coloration but smaller and narrower, being oblanceolate, *lip* small, very fleshy, white, dotted and streaked with pink, *spur* very

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short, obtuse, *side lobes* shallow, rounded, *disk* with crisp, white hairs, *midlobe* ovate, margins crenulate.

Flowers appear from April onwards throughout the rains.

Distribution—Western Ghats and Konkan to Ceylon. This is one of the commonest orchids of the Konkan, always easily recognized by its stiff erect growth and red banded flowers.

PLATE X.—Saccolabium Wightianum, *Hook. f.*—Part of plant (life size). *a.* pollinia × 3. *b.* a flower seen from the front × 2. *c.* a root. *d* two fruits (natural size).

2. SACCOLABIUM VIRIDIFLORUM, *Lindl., Fl. Br. Ind. VI, p. 63*; Sarcochilus viridiflorus, *T. Cooke, Fl. of Bombay, II, p. 697; Dalz. and Gibs. p. 263.*

A small epiphyte, *roots* long. *Leaves* flaccid, strap-shaped, up to 3½ inches long by ½ inch broad, usually in single pairs on each plant, *base* narrowed, *apex* retuse. *Racemes* up to 2½ inches long, from lower axils, usually two on each plant, *rachis* stiffly erect, many flowered. *Flowers* ⅓ inch in diameter, *sepals* and *petals* greenish white, *lateral sepals* obovate obtuse, *dorsal* similar but more pointed, *petals* as large as and similar to the sepals, *lip* with a very broadly conical, short, blunt spur, *lateral lobes* small, triangular, *terminal* spreading fan-shaped *margins* crenulated with a triangular projection on the centre, *column* green, *pollinia* 2, lobed, *caudicle* long, *gland* large.

Flowers during the rains.

Distribution.—Forests of the Konkan and Western Ghats and moist parts of the Western Peninsula generally.

3. SACCOLABIUM MACULATUM, *Hook., f. Fl. Br. Ind. VI, p. 64*; Sarcochilus maculatus, *Benth. T. Cooke, Fl. of Bombay, II, p. 698*; Micropera maculata, *Dalz. and Gibs. p. 263.*

Almost stemless. *Leaves* up to 6 inches long, linear or cuneately-oblong obliquely 2-lobed at apex. *Racemes* almost twice as long as the leaves, *rachis* erect stout, laxly many flowered, *bracts* short, broad. *Flowers* ½ inch in diameter, subsessile, *sepals* and *petals* similar, obovate, each yellow with a central purple spot, *lip* white and pink, *spur* short, obtuse, villous within, *side lobes* small, erect, triangular, *midlobe* very leathery, described by Dalzell as being like a side saddle, *margins* membraneous, 3-lobed at the apex.

Flowers appear in May.

Distribution.—Moist forests of the Western Ghats, Peninsula and Konkan.

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22. SARCANTHUS.

Epiphyte, *stems* pendulous, elongate, leafy. *Leaves* fleshy. *Flowers* small, in *racemes* shorter than the leaves, *bracts* small, *sepals* subequal, *petals* rather smaller than the sepals, *lip* adnate to the foot of the column, *spur* conical, with the cavity divided by a vertical *septum* and with a dorsal 2-lobed *callus*, *lateral lobes* small, *midlobe* small, incurved, *column* short, *anther* beaked, *pollinia* 2, bipartite, *caudicle* slender, *gland* small.

1. SARCANTHUS PENINSULARIS, *Dalz. Fl. Br. Ind. VI, p. 67; Dalz. and Gibs. p. 264; T. Cooke, Fl. of Bombay, II, p. 706, (by error* peduncularis).

Stem as thick as a duck's quill, flexuous, green, invested by the leaf sheaths, up to a foot in length. *Leaves* 4 to 6 inches long by ½ inch broad, fleshy, curved, linear—lanceolate acuminate, narrowed at the base. *Racemes* about 1½ inch long, leaf opposed, *flowers* deflexed, scattered, ¼ inch in diameter, *bracts* minute, *rachis* slender, *pedicels* very short, *sepals* and *petals* spreading, yellow with intramarginal red bands, *lateral sepals* elliptic obtuse, *dorsal* a little longer and narrower than these, *petals* subequal to the lateral sepals, spathulate, *lip* with violet *lateral lobes* and a pink, incurved, acute midlobe, *spur* conical, septate, *dorsal callus* small.

Flowers during the rains.

Distribution.—This species only occurs in North Kanara within our area, from thence it extends southwards to Travancore and Ceylon.

23. CLEISOSTOMA.

This differs from Sarcanthus only in the *spur* not being septate and from Saccolabium in having a dorsal scale or callus within the spur beneath the column.

1. CLEISOSTOMA (sp. nov. ?).

Stem about 3 inches long, as thick as a goose quill. *Leaves* sheathing, greenish brown, coriaceous, keeled, linear-oblong emarginate, up to 14 inches in length. *Inflorescence* shortly racemose, *peduncle* slender, stiffly erect, bearing pink flowers, each ⅓ inch in diameter, in clusters of 6 towards the apex; *sepals* broadly ovate, semi-patent, broader than the petals, *lip*, base spurred, continuous with the column, *spur* obtuse, incurved, with two *calli* at its mouth, *blade* 3-lobed, *lateral lobes* shallow, pointing forwards, *midlobe* broadly triangular obtuse, *column* short, broad, *foot* 0, *anther* 1, *pollinia* 2, each bilobed.

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The above is the description, written at the time of collection, of an orchid found on the Divimona Ghat in North Kanara, before 1902, when my specimens and drawings were destroyed by fire. The plants flowered at the beginning of the rains. I lost these some years ago and have never had an opportunity of collecting them again. Dr. Cooke, in his "Flora of Bombay" does not include this genus in his account of Orchidaceæ. I have never been able to identify the plant with any that are described or figured so that it is probably new.

24. DIPLOCENTRUM.

Epiphyte with a short, leafy stem. *Leaves* few, two-ranked, linear, fleshy, unequally 2-lobed at apex. *In florescence* a pendulous *raceme*, branched near the base. *Flowers* small, rather crowded, *bracts* minute, *pedicels* and *ovary* short, *sepals* spreading, connivent at base, *lateral* falcate, larger than the *dorsal*, all obtuse, *petals* shorter and narrower than the dorsal sepal, acute, *lip* thick entire, fixed on the base of the column, with two short blunt *spurs*, *column* short, thick and blunt, 2-auricled, *anther* 2-celled, *pollinia* 2, ovoid, furrowed or bipartite, attached by a broad strap to a broad *gland*.

1. DIPLOCENTRUM CONGESTUM, *Wight. Fl. Br. Ind., VI., p. 78; T. Cooke, Fl. of Bombay, II, p. 704.*

Leaves in 2 or 3 pairs, recurved, about 3 inches long. *Peduncles* stout, simple or with a few branches near the base. *Flowers* crowded, especially so towards the tips of the spikes, each about $\frac{1}{4}$ inch in diameter, *bracts* minute, triangular-ovate, *pedicels* very short, *sepals* greenish brown, tinged with pink, *lateral* falcately oblong obtuse, *dorsal* elliptic oblong, *petals* also greenish brown, tinged with pink, *lip* pink suffused with brown, about $\frac{1}{6}$ inch long, fleshy, oblong obtuse, *column* white, *auricles* pink.

Flowers appear during the commencement of the rainy season.

Distribution.—On trees in the forests of North Kanara and also recorded from the Iyemally Hills in Travancore by R. Wight, who figured it in his Icones, Plate 1682.

It is a mean looking plant rising so little above the moss in which it grows that it usually remains unnoticed. In Poona, where some plants were kept alive for a few years the spikes became very short indeed.

(*To be continued.*)

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THE BUTTERFLIES OF KUMAUN.

BY

F. HANNYNGTON, I.C.S.

(*With a Map.*)

INTRODUCTION.

The Kumaun Division, comprising the Districts of Almora, Naini Tal and Garhwal, is bounded on the north by Tibet, on the south by the Pilibhit, Bareilly, Moradabad and Bijnor Districts, on the east by Nepal, and on the west by the Native State of Tehri Garhwal and the Dehra Dun and Bijnor Districts. For entomological purposes it may be roughly divided into 3 areas :—

(1) Tropical from 1,000-2,000 ft. above sea-level.

(2) Sub-Tropical and Temperate from 2,000-9,000 ft. above sea-level, comprising the greater part of Kumaun and consisting of a series of ranges and peaks intersected by deep valleys.

(3) Alpine and Sub-Alpine from 9,000 ft. up to the snow-line.

The first region with a purely artificial boundary on the south abounds with forms to be met with in the plains together with a fair number of endemic forms; the second contains by far the larger number of species herein enumerated while the third is the home of the palæarctic forms dependent for their food-supply on the shrubs and grasses between the tree-limit and the region of perpetual snow.

While containing so far as I have been able to determine, no species of butterfly peculiar to itself, Kumaun forms a most interesting connecting link from an entomological point of view between the Sikkim forms on the one hand and the purely N. W. Himalayan forms on the other. Of the three districts, Garhwal has been far less thoroughly worked than Naini Tal or Almora and parts of it are still more or less a *terra incognita* to the naturalist. The only previous list of the butterflies of this region extant to my knowledge is the one compiled by Doherty in 1886 and published in the Journal of the Asiatic Society of Bengal, Volume LV, part 2. This list is probably inaccessible to the majority of readers of this Journal: it includes a number of species now generally recognised as local races of more

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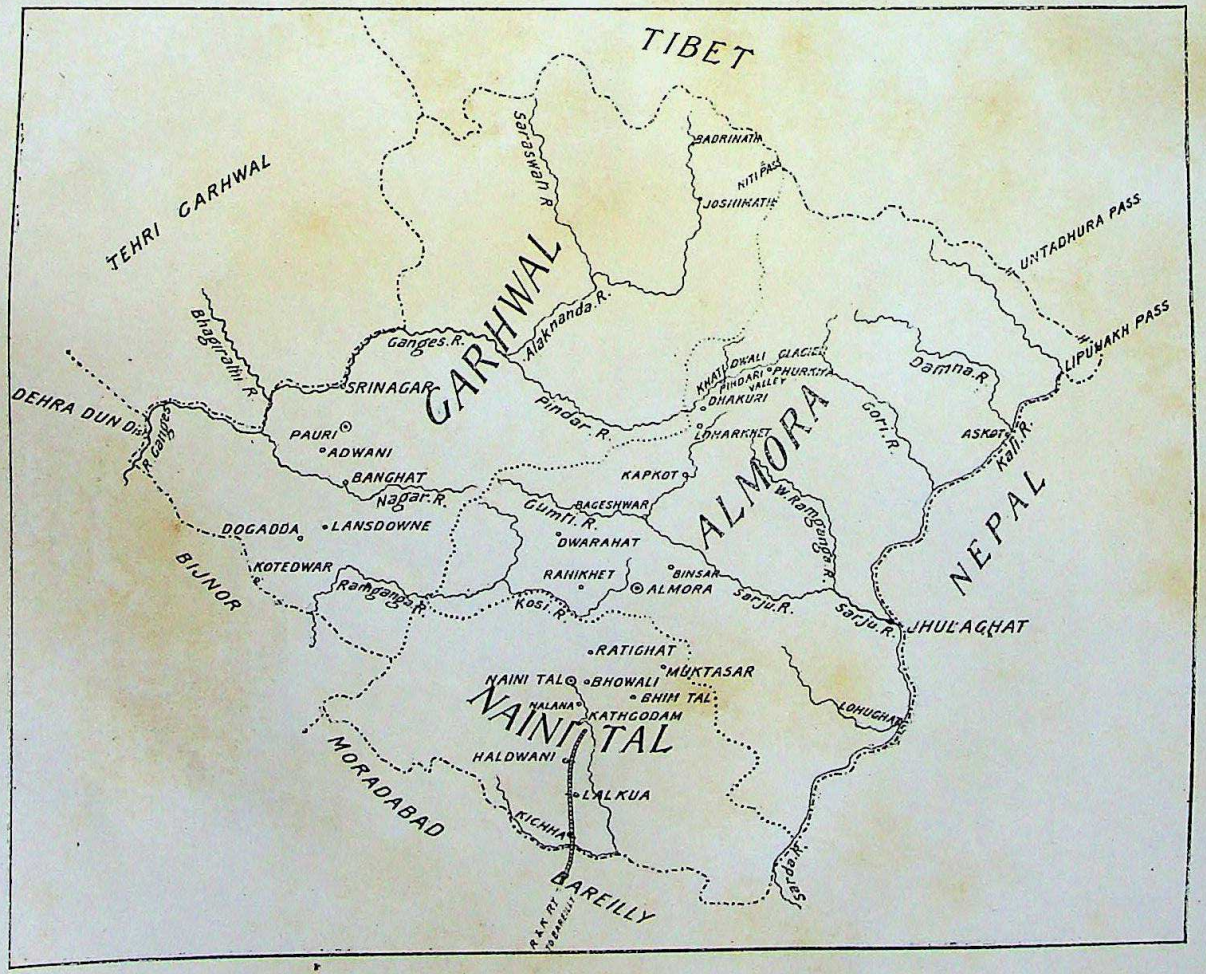

THE BUTTERFLIES OF KUMAON.

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widely distributed forms and more than one species of whose occurrence in Kumaon I am still doubtful, while it omits a fair number of forms which have since been found commonly in the district. Seeing that this list, which enumerates 271 species, was the result of a stay of less than six months in Kumaun with only two trips into the interior, one of which Doherty himself confesses to have been a failure, degenerate entomologists of the present day cannot but admire the author's wonderful energy and accuracy of observation.

Treating of the question of local distribution, Doherty remarks that the Kali Valley—the Eastern boundary of Kumaun—" forms a " genuine zoological boundary.

" Among the species that seem to extend no further west are :— " *Papilio paris*, *Melanitis zitenius*, *Elymnias lencocyma* (=*malelas*), " *Symbrenthia hypselis*, *Neptis vikasi*, *Euthalia appiades* and *E.* " *lubentina* and such genera and sub-genera as *Dyctis*, *Rohana*, " *Dichorrhagia*, *Moduza*, *Haridra*, *Zemeros*, *Chersonesia*, *Chliaria*, " *Remelana* and *Cheritra*."

The danger of hasty generalisation of this nature is well borne out by the present list, nearly all the genera enumerated above being represented in West Kumaun and in some cases by more than one species, while at least two of the species—*S. hypselis* and *E. lubentina*—are to be met with in the extreme west.

The fact is that it is almost impossible to lay down hard and fast geographical boundaries when dealing with Himalayan species. Kumaun is a " debateable area " between the south-east and south-west monsoon currents and receives rain from both. When the south-east or Bay current is stronger than that from the Arabian Sea, stragglers from Sikkim like *Arhopala centaurus* or *Euthalia lepidea* may be found as far west as Naini Tal at all events, while conversely, a strong Arabian Sea current will bring in stragglers from the N. W. Himalayan area like *Nytha parisatis* and *Erebia hyagriva*.

Leaving aside the chief factor which is, of course, the presence of the food-plant which supports the larva, the distribution of Himalayan species will, I think, be found to depend chiefly upon the relative strength or weakness of these two currents and as this is a variable phenomenon, it is next to impossible to lay down specific geographical boundaries ; this too probably accounts for the fact that Kumaun contains no species peculiar to itself.

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In compiling the present list I have had constant access to the fine collection of Mr. Peake at Jeolikote which includes a most representative Kumaun collection made by the late Mr. Vanrenen of Binsar throughout a number of years. I have also embodied my own two years' experience, though I have been compelled through force of circumstances to depend very largely on native agency for the collection of specimens. The total number of separate forms recorded is 371.

Thanks to Mr. P. Mackinnon's generous help in identification of doubtful species, I hope that the list will be found fairly complete and, if it should prove of assistance to future workers over the same ground, its purpose will have been served.

I have marked with an asterisk any form that has not come under my personal observation. In classification and nomenclature I have, where possible, followed Bingham, whose firm stand against the ultrasectionist tendencies of some latter-day entomologists entitles him to the gratitude of posterity. That he did not live to complete his work is nothing short of a calamity.

A word as to seasons and localities. As in most parts of India, the greatest number of varieties are on the wing just after the rains in September and October, but the early summer (March and April) is only slightly less prolific in species of interest to the collector. Taking the whole year round, the wooded ravines at from 2,000-5,000 feet elevation will be found the best hunting grounds, especially in the dry months.

At high elevations above 12,000 feet, the season is late and short, beginning in July and ending in September, the rarer forms not appearing till August. The commoner varieties will, however, be found encroaching on the snow line even as early as May.

Butterflies are so easily influenced by vicissitudes of season that it is not surprising to find many species common in one year, and scarcely visible in the next. For instance, a very dry season like 1907 resulted in a "miraculous draught" of *Dophla patala* around Naini Tal in May 1908, while in 1909 this butterfly did not appear till June and was comparatively rare in all its favourite haunts. Not only so, but the early rains in July caused the few that were on the wing to disappear with disconcerting suddenness. As a rule, however, the converse holds good and heavy rains result in great abundance of in-

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dividuals not only on the cessation of the monsoon, in September, but in the following March and April. This is doubtless to be explained by the abundance of food-plants for the larvæ; the exceptions will only be in the case of larvæ like *Dophla patala* which feed on oaks and hardy trees but little affected by drought. Forest fires, too, must destroy myriads of larvæ in a dry year.

FAMILY—NYMPHALIDÆ.

Sub-family—DANAINÆ.

1. **Danais limniace,** *Cramer.*—Common. April-October. 2,000 to 5,000 ft.

2. **Danais aglea melanoides,** *Cram.* (Parantica melanoides, *Moore*).—Common in April and May and from July to October at from 3,000 to 5,000 ft.

3. **Danais septentrionis,** *Butler.*—Common. May and September. 1-5,000 ft.

4. **Danais tytia,** *Gray.*—Fairly common in wooded nullahs in April and May and again in September and October at 3-5,000 ft.

5. **Danais melanea,** *Cramer.*—Rare in the Tarai in January.

6. **Danais plexippus,** *Linn.*—Common everywhere up to 5,000 ft.

7. **Danais chrysippus,** *Linn.*—Common everywhere up to 5,000 ft.

The *Euplainæ* are only represented in Kumaun by three species, two endemic and the third a rare visitor from Nepal.

8. **Euploea core,** *Cram.*—Very common at 2-5,000 ft. especially in July and October.

9. ***Euploea splendens,** *Butler* (rogenhoferi, *Felder*).—Recorded by Bingham from Eastern Kumaun. I have not met with it from this locality into which it appears to come as a rare straggler from Nepal.

10. **Euploea mulciber,** *Bingham* (midamus, *Linn.*).—Rare at Nalena, at 3-4,000 ft. in April and May. Common in Kali and Sarju Valleys in August.

SATYRINÆ.

The *Satyrinæ* are well represented throughout Kumaun, fifty-two forms being recorded.

11. **Mycalesis sanatana,** *Moore.*—Rare at Binsar and Askot, 6-8,000 ft. in May and October. The wet-season form (*gopa*) may be looked for in August at 6,000 ft. at Ramgarh, Takula, etc.

12. **Mycalesis perseus,** *Fabr.*—Common. 1-6,000 ft. in March, April, May and October. The wet-season form (*M. blasius*) occurs plentifully at Ranibagh and elsewhere from July to September.

13. **Mycalesis mineus,** *Linn.*—With its dry-season form (*otrea*) occurs in the same localities as *M. perseus*, but is not so common.

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14. **Mycalesis visala,** *Moore.*—Common in the Tarai in October. I have not come across the wet-season form which is almost indistinguishable from the wet-season form of *M. mineus* (*vide* Bingham, Vol. I, p. 60).

15. **Mycalesis malsara lepcha,** *Moore.*—Common from March to October at 3-5,000 ft. in shady ravines. It has been usual hitherto to regard *M. lepcha* as the dry form of *M. malsara.* Bingham, however, classes both forms as a race of *M. malsara.*

16. **Mycalesis nicotia,** *Hewitson.*—And its dry season form (*M. langi*, de Nicèville) occur sparingly at 2-5,000 ft.

17. **Mycalesis heri,** *Moore.*—Doherty took a dry-season form at Jhulaghat 2,000 ft. and 2 wet-season specimens at Kapkot and Baghrighat 3-7,000 ft. J. S. B. 1886, p. 115. I have never come across it.

18. **Orsotriaena moda,** *Fabr.*—A single male from Kichha on the Southern border in September.

19. **Lethe europa,** *Fabr.*—Rare at Ranibagh, 2,000 ft. in December.

20. **Lethe rohria,** *Fabr.* (L. dyrta, *Felder*).—Common. April to October at 2-7,000 ft.

21. **Lethe ihsana,** (L. hyrania), *Kollar.*—Common throughout Kumaun at 7,000 ft., June to October.—The darker *dinarbas* form occurs from Binsar eastwards.

22. **Lethe confusa,** *Aurivillus* (L. rohria, *Fabricius*).—Common from June to October at 2-7,000 ft.

23. **Lethe verma,** *Kollar.*—Not uncommon at Binsar and Naini Tal. 6-8,000 ft. in August and September.

24. **Lethe sidonis,** *Hewitson.*—I am doubtful whether this is not really the dry season form of *L. vaivarta* as described by Doherty (J.A.S.B. 1886, p. 115). Both forms are to be found throughout Kumaun at about 7,000 ft., but *L. vaivarta* is only on the wing during the rains. It seems questionable whether the latter is even a local race.

25. **Lethe vaivarta,** *Doherty.*—Dhakuri, Khati 7-11,000 ft. (Doherty). Fairly common at about 7,000 ft. from July to September.

26. **Lethe nicetas,** *Hewitson.*—Common at 3-6,000 ft. from June to October.

27. **Lethe maitriya,** *de Nicèville.*—Not common at 6-10,000 ft. in May and October in higher river valleys.

28. **Lethe kansa,** *Moorè.*—Common on Cheena, Naini Tal at 8,000 ft. and less so at Nalena, 4,500 ft. in April and May. Apparently not recorded before so far west. The underside is much paler than in specimens from Sikkim and Assam and the three white subapical spots on the upperside of the fore-wing are more prominent, thus approaching *L. sinorix.* The specimen from Nepal in the British Museum exhibits the transition to the Kumaun form.

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29. **Lethe (Zophoessa) jalaurida,** *de Nicéville.*—Dhakuri, Khati, Pindari Valley, 7-11,000 ft. (Doherty). Evidently rare outside the Pindari Valley. I have only received specimens from that locality, and it is not in the Vanrenen collection.

30. **Lethe (Zophoessa) baladeva,** *Moore.*—Common in Pindari Valley, 7-9,000 ft. in May and August. Flies fast and is difficult to capture owing to its habit of settling in clumps of bamboo on which its larva doubtless feeds.

31. **Lethe (Zophoessa) coalpara,** *Moore.*—Habitat recorded by Bingham as the Himalayas from Simla to Sikkim. I have only received specimens in Kumaun from the Sarju Valley 4,000 ft. in September.

32. **Lethe (Zophoessa) Yama,** *Moore.*—Not uncommon at Naini Tal and Binsar at 7,000 ft. in May and June.

33. **Lethe (Neope) pulaha,** *Moore.*—Rare at Binsar and on the Eastern border in September.

34. **Orinoma damaris,** *Gray.*—Decidedly rare at Nalena and at the third mile on the Ratighat Road below Naini Tal in September at about 4,000 ft.

35. **Rhaphicera moorei,** *Butler.*—Not uncommon in the Pindari and other interior valleys at 7-11,000 ft. in August and September. De Nicéville records *Rhaphicera satricus,* Doubleday, as occurring " in the wooded hills beyond Almora in Kumaun " (*vide* Atkinson). It is not in the Vanrenen collection and *R. moorei* occurs considerably to the East of Almora. Though there is no reason why it should not stray over the Eastern border, I hesitate to include it in the absence of recent evidence.

36. **Satyrus (Amecera) schakra,** *Kollar.*—Common in May to October on stony ground at from 4,500 to 11,000 ft.

37. **Nytha (Hipparchia) parisatis,** *Kollar.*—Rare in the extreme west of Garhwal on the borders of Tehri in September.

38. * **Maniola davendra,** *Moore.*—(*vide* Bingham, Vol. I, p. 119. "Recorded also by Felder from Kumaun.")

39. **Maniola pulchella,** *Felder.*—To be found at and above 12,000 ft. in inner ranges in August.

40. **Aulocera brahminus,** *Blanchard.*—Not uncommon at the same altitude and season as the foregoing.

41. **Aulocera swaha,** *Kollar.*—Very common from August to October at 6,000-10,000 ft. The commonest butterfly on the wing in Naini Tal in September.

42. **Aulocera padma,** *Kollar.*—Occurs sparingly from May to October ta 5,000 to 8,000 ft. at Binsar and on the inner ranges. A rare visitor on Cheena in May, June and July.

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43. **Aulocera saraswati,** *Kollar.*—Rare in August and September on the grassy slopes between 6,000 and 10,000 ft. frequented by its congener, *A. swaha.*

44. * **Æneis pumilis,** *Felder.*—"One male. Chinese Tibet 17,000 ft.' (Doherty). Probably very rare on the Kumaun side of the Passes.

45. **Ypthima philomela indecora,** *Moore.*—Common in the valleys up to 6,000 ft. from June to October.

46. **Ypthima baldus,** *Fabr.*—This, the *Y. philomela* of de Nicéville, is fairly common from June onwards up to 5,000 ft. Its dry season form (*Y. marshalli*, Butler) is common at Haldwani from December to March.

47. **Ypthima sakra,** *Moore.*—Common at 2,000-7,000 ft. May to October.

48. **Ypthima nareda,** *Kollar.*—Common at 2,000-7,000 ft. April to October, especially in the vicinity of Naini Tal in August.

49. **Ypthima avanta,** *Moore* (= Y. singala, *Felder*).—Wet-season form common at 2-6,000 ft. from June to August and dry-season form common in Tarai in cold weather.

50. **Ypthima huebneri,** *Kirby.*—With its dry-season form (*Y. howra*) common at same times and places as the last.

51. **Ypthima asterope,** *Klug.*—Rare in the low river valleys at about 3,000 ft. from August to October.

52.* **Erebia kalinda,** *Moore.*—Has been taken at 10,000 ft. in the interior of Garhwal. I have not come across it.

53. **Erebia nirmala,** *Moore.*—Very common from May to September at 4,000-8,000 ft., sometimes swarming at Naini Tal in damp, cloudy weather.

54. **Erebia annada,** *Moore.*—Common in May and again in August to October at Naini Tal and hills from 6-8,000 ft. The wet-season form (*E hybrida*) is almost indistinguishable from *E. nirmala.*

55. **Erebia scanda,** *Kollar.*—Fairly common between 7 and 11,000 ft. May and October.

56. **Erebia (Ypthima) hyagriva,** *Moore.*—Common during the rains at 3-7,000 ft.

57. **Melanitis ismeno,** *Cramer.*—Common up to 7,000 ft. May to November.

58. **Melanitis bela,** *Moore.*—Not common in the river valleys from 2-4,000 ft. August to October.

59.* **Melanitis zitonius,** *Herbst.*—Rare in the Kali Valley in the extreme East in August.

60. **Elymnias undularis,** *Drury.*—The males are common at 2-5,000 ft. July to October in shady ravines. The females do not appear till September and are comparatively scarce.

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61. **Elymnias malelas,** *Hewitson* (= E. leucocyma, *de N.*)—Fairly common, August to October, in river valleys bordering on Nepal.

62.° **Elymnias (Dyctis) patna,** *Westwood.*—"Two males at Junction of Kali and Gori Rivers" (Doherty).

Sub-family—NYMPHALINÆ.

63. **Charaxes marmax (lunawara),** *Westwood.*—Rare in Kali Valley in the extreme East in August and September.

64. **Charaxes polyxena homana,** *Butler.*—Rare at Kapkot on the Sarju and in Kali and Gori Valleys in August.

65. **Charaxes fabius,** *Fabr.*—Fairly common in river valleys debouching on the plains up to 2,000 ft. in July and August.

66. **Eulepis athamas,** *Drury.*—Common up to 3,000 ft. from July to October on outer hills.

67. **Eulepis eudamippus,** *Doubleday.*—Rare in low river valleys, September to November.

68. **Eulepis dolon,** *Westwood.*—Has been taken at Kilberry near Naini Tal in September. Very rare.

69. **Apatura ambica,** *Kollar.*—Occurs sparingly in outer ranges up to 5,000 ft. from April to October.

70. °**Apatura arpisatis,** *Westwood.*—"One male seen at Jhulaghat." (On the extreme eastern border) Doherty. It is evidently a rare visitor on the extreme east and I have not heard of its being actually taken in Kumaun up to date.

71. **Dilipa morgiana,** *Westwood.*—Very rare in Kumaun. A single male was brought to me from the Pindari Valley by a native catcher in August. It is said to occur at Bhim Tal.

72. **Hestina nama,** *Doubleday.*—Rare at Binsar in June and on eastern border in the rains.

73. **Perhestina persimilis zellas,** *Butler.*—Common at Nalena, 4,500 ft. from June to October and more sparingly up to 7,000 ft.

74. **Euripus consimilis,** *Westwood.*—Rare along outer ranges up to 3,000 ft. in April, July and August.

75. **Sephisa dichroa,** *Kollar.*—Common at Takula, Binsar, Naini Tal, etc., 6-8,000 ft. in May and October.

76. **Sephisa chandra,** *Moore.*—Rare in eastern valleys at 4,000 ft. in May.

77. **Dichorragia nesimachus,** *Boisduval.* Rare in river valleys on extreme East and at Binsar and Nalena at about 4,000 ft. in April and August.

78. **Stibochiana nicaea,** *Gray.*—Occurs sparingly in ravines at 4,000-7,000 ft. in May, June and July.

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79. **Dophla patala,** *Kollar.*—Common at Naini Tal and Bhowali, 4-8,000 ft. in May and June. The larva may be found on oak trees (*Quercus incana*) in May.

80. ***Euthalia lepidea,** *Butler.*—A single male was taken by Mr. de Rhè Philippe in April 1902 at Ranibagh, 2,000 ft. (*vide* Volume XIV, No. 3, page 595, of the Society's Journal.)

81. **Euthalia appiades,** *Ménétriés.*—Not common in river valleys on the extreme East.

82. **Euthalia lubentina,** *Cramer.*—Scarce near Nalena, at 4,000 ft. in October and November and in Kali Valley in August.

83. **Euthalia garuda,** *Moore.*—Fairly common in April and again in October in valleys at 2-4,000 ft. throughout Kumaun.

84. **Euthalia (Symphaedra) nais,** *Forster.*—Has been taken at Haldwani 1,000 ft. and Bhim Tal 3,000 ft. in March, but is only a rare visitor along the outer ranges.

85. **Moduza procris,** *Cram.*—Rare at Haldwani in Tarai from October to January. Its occurrence so far north is unusual. Bingham gives its habitat as Peninsular India.

86. ***Liminitis daraxa,** *Doubleday.*—Recorded by Atkinson from Kumaun (de Nicéville, Volume II, page 158.) I have never met with it.

87. **Auzakia (Liminitis) danava,** *Moore.*—Common in shady ravines at 4,000 to 8,000 ft. April, May and again from August to October.

88. **Pantoporia cama,** *Moore.*—Common, April to October at 2,000-5,000 ft. near streams.

89. **Pantoporia selenophora,** *Kollar.*—Not common at 6,000 ft. in April and May.

90. **Pantoporia zeroca,** *Moore.*—Rare at Nalena 4,500 ft. and Binsar, 8,000 ft. in May and June.

91. **Pantoporia opalina,** *Kollar.*—Common from April to October in wooded nullahs at 3,000-7,000 ft.

92. **Athyma perius,** *Linn.*—Common in April and October in the same localities as the last-named.

93. **Athyma asura,** *Moore.* Rare at Binsar 8,000 ft. in August.

94. **Neptis eurynome,** *Westwood.*—Common all over Kumaun from 2-7,000 ft. This form includes *N. astola, emodes, varmona* and *eurymene* as recorded from Kumaun by Doherty.

95. **Neptis columella,** *Cram.*—Not common at Haldwani and Ranibagh in December and January.

96. **Neptis mahendra,** *Moore.*—Common from May to October at 6-9,000 ft.

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97. **Neptis yerburii.** *Butler* (=N. nandina, *Moore*).—Common in April and May at 3-6000 ft.

98. **Neptis soma,** *Moore* (=N. susruta, *Moore*).—Common in the rains at 2-5,000 ft.

99. **Neptis sankara,** *Kollar* (=N. amba, *Moore*).—Common from April to July at 4-9,000 ft.

100. **Neptis narayana,** *Moore.*—Very rare at from 5-6,500 ft. in May.

101. **Neptis vikasi pseudovikasi,** *Moore.*—Not common in wooded ravines at 3,000 ft. in August and September. Doherty found it rare at Kapkot, 4,000 ft.

102 **Neptis zaida,** *Doubleday.* Not uncommon at Nalena, 4,500 ft., in June and July.

103. **Neptis radha,** *Moore.*—Not common at Nalena, 4,500 ft., in May and at Bageshwar 3,200 ft. in October.

104 **Neptis ananta,** Moore.—Fairly common 3,000 ft. in August and September.

105. **Neptis viraja,** *Moore.*—Not uncommon at Nalena, 4,500 ft. in June.

106. **Rahinda hordonia,** *Stoll.*—Common in April and May at 3,000-5,000 ft. near wooded streams.

107. **Cyrestis thyodamas,** *Boisduval.*—Common everywhere up to 8,000 ft. April to October. The pale yellow form appears to be peculiar to higher elevations in the dry season, in Kumaun at all events.

108. **Chersonesia risa,** *Doubleday.*—One male, Kapkot, Sarju Valley, 3,700 ft. in May. Doherty took it at 2-3,000 ft. in the Kali Valley in August.

109. **Junonia iphita,** *Cram.*—Common everywhere up to 7,000 ft.

110. **Junonia lemonias,** *Linn.*—Common everywhere up to 7,000 ft.

111. **Junonia orithya,** *Linn.*—Common on open hill-sides up to 9,000 ft.

112. **Junonia hierta,** *Fabr.*—Not quite so common and confined to open hill-sides.

113. **Junonia almana,** *Linn.*—Common in river valleys up to 4,000 ft. Its wet-season form (*asterie*) is very common at Ranibagh in the rains.

114. **Junonia atlites,** *Johannsen.*—Rare in the Tarai in January and February.

115. **Vanessa cardui,** *Linn.*—Common from June to October at 6-10,000 ft.

116. **Vanessa indica,** *Herbst.*—Very common, 3,000-11,000 ft. March to November.

117. **Vanessa kashmirensis,** *Kollar.*—Very common 2-18,000 ft. March to October. I have a curiously melanized specimen taken on Cheena in May.

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118. **Vanessa rizana.**—Occurs in inner ranges above 10,000 ft. in July and August.

119. ***Vanessa ladakensis,** *Moore.*—"Near Kalapani, Nepalese Tibet, 14,000 ft." (Doherty).

120. **Vanessa xanthomelaena,** *Denis.*—Common on Cheena, Binsar, and Dhakuri from March to May and again in October at 8,000 to 11,000 ft. The life-history of this butterfly as described by de Nicéville (Vol. II, p.) is very strange. It is certainly double-brooded but I do not believe that the second brood "disappears" from June till the following March as I have it from the Pindari Valley in October. It seems more probable that it passes the winter as an imago like so many of its congeners, emerging early in the following spring and producing a second brood in September. I obtained the larvæ from Binsar early in October, but they unfortunately died before pupating.

121. **Vanessa canace,** *Johannsen.*—Common in May and June and again in September and October at 5,000 to 10,000 ft.

122. **Vanessa c. album,** *Linn.*—Not uncommon in the Pindari Valley at 8,000-12,000 ft. in May and August.

123. **Symbrenthia lucina,** *Cram.* (= S. hippoclus, *de N.*) Common in April, May, August, September and October in wooded nullahs from 3,000-6,000 ft.

124. **Symbrenthia hypselis,** *Godart.*—Not uncommon throughout Kumaun in April and May and again in September, October at 2,000-6,000 ft. often along with the last-named.

125. **Symbrenthia brabira,** *Moore.*—Doherty separates the wet and dry-season forms of this species (as *hysudra* and *S. asthala*). It is fairly common in the inner valleys at 7-9,000 ft. in May and August.

126. **Hypolimnas bolina,** *Linn.*—This fine butterfly appears on the wing in July, and may be found from the plains up to 8,000 ft. till December.

127. **Hypolimnas misippus,** *Linn.*—Not so common and confined to the outer ranges up to 4,000 ft. in April and again from August to November.

128. **Kallima inachus,** *Boisduval.*—Common in nullahs from 2,000 to 6,000 ft. April to October.

129. ***Cethosia cyane,** *Drury.*—Though recorded from Kumaun, I have not yet come across any specimens. It doubtless occurs on the Eastern border as it is common in Sikkim.

130. **Atella phalantha,** *Drury.*—Very common from June to December up to 7,000 ft.

131. **Issoria sinha,** *Kollar.*—Rare at Nalena 4,500 ft. in May and again in September.

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132. **Cupha erymanthis,** *Drury.*—Common in May, June and October in valleys up to 4,500 ft.

133. **Argynnis jainadeva,** *Moore.*—Rare in minor ranges above 9,000 ft., July to October.

134. **Argynnis kamala,** *Moore.*—Fairly common on the inner ranges, 8,000—10,000 ft., May to September.

135. **Argynnis childreni,** *Gray.*—Common from June to October at 5,000-10,000 ft. Most of the specimens from Naini Tal are true *childreni*. The *sukantala* type occurs further west.

136. **Argynnis hyperbius,** *Johanssen.*—Common up to 7,000 ft. in April and May and from July to October.

137. ***Argynnis gemmata,** *Butler.*—Recorded by Bingham from Kumaun. I have not come across it in any local collection.

138. **Argynnis lathonia issaea,** *Doubleday.*—Very common, April to October, 5,000-10,000 ft.

139. ***Argynnis clara,** *Blanchard.*—Very local in interior of Tehri Garhwal in August in high river valleys.

140. **Melitaea sindura,** *Moore.*—Rare at 12,000 ft., June to August.

141. **Ergolis ariadne,** *Johanssen.*—Not uncommon at 2,000-5,000 ft. in September and October.

142. **Ergolis merione,** *Cram.*—Common up to 6,000 ft. May to December. Its conspicuous larva makes little attempt at concealment on the leaves of the Castor Oil plant on the underside of which it pupates. The butterfly is mimicked by the ♀ of *Apatura parisatis* and is undoubtedly protected, though I am unable to determine precisely what form the protection takes.

143. **Pseudergolis wedah,** *Kollar.*—Common up to 8,000 ft. March to October.

ACRÆINÆ.

144. **Pareba vesta,** *Fabr.*—Very common in the rains at 3-6,000 ft. in the neighbourhood of its food-plant, *Bœhmeria salicifolia*.

145. **Telchinia violae,** *Fabr.*—A single male taken at Bhim Tal, 3,000 ft. in October. It probably occurs sparingly in the Tarai as it is common in Oudh in the Rains.

LIBYTHÆINÆ.

146. **Libythea celtis lepita,** *Moore.*—Very common, May to October, at 4,000 to 7,000 ft.

147. **Libythea myrrha,** *Godart.*—Very common, May to October especially at 4,000 ft. in August after heavy rain.

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FAMILY—NEMEOBIDÆ.

148. **Dodona durga,** *Kollar.*—Very common, May to October especially at Ramgarh, 6,000 ft.

149. **Dodona dipoea,** *Hewitson.*—Common at 4-7,000 ft.

150. **Dodona eugenes,** *Bates.*—Fairly common, March to October at 3,000-7,000 ft.

151. **Dodona ouida,** *Moore.*—Rare and local on Binsar and Cheena at 7,000 ft. in May and October.

152. **Abisara fylla,** *Doubleday.*—Not common at 4,000 to 8,000 ft., Nalena, Binsar, Naini Tal, etc., in April and again in September.

153. **Abissara ocherius,** *Stoll* (= Abisara suffusa, *Moore*).—Common from July to October at 2-4,000 ft. in river valleys.

154. **Zemeros flegyas,** *Cram.*—Common from March to October at 3,000 to 5,000 ft. in valleys near water.

(*To be continued.*)

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DESCRIPTIONS OF INDIAN MICRO-LEPIDOPTERA.

BY

E. MEYRICK, B.A., F.R.S., F.Z.S.

XI.

ŒCOPHORIDÆ.

Macrobathra equestris, n. sp.

♀. 18 mm. Head and thorax dark bronzy-fuscous. Palpi dark fuscous, rather obscurely lined with ochreous-whitish. Antennæ white spotted with blackish. Abdomen dark fuscous, segmental margins mixed with ochreous-whitish. Forewings elongate-lanceolate ; fuscous, towards base dark fuscous ; a broad transverse yellow fascia extending from $\frac{1}{6}$ to middle, edged with a few black scales : cilia brownish. Hindwings dark grey ; cilia fuscous.

Khasis, in April ; one specimen. In every respect a characteristic member of this distinct genus, which is largely developed in Australia, but has not hitherto been recorded elsewhere.

Borkhausenia pseudospretella, Stt.

Newera Eliya, Ceylon ; Khasis ; in April, May, and September. A domestic pest.

Borkhausenia obolœa, n. sp.

♀. 13h-14 mm. Head and thorax fuscous, slightly whitish-sprinkled. Palpi yellow-whitish, second joint externally suffused with dark fuscous irroration except more or less beneath and at apex. Antennæ fuscous. Abdomen grey. Forewings elongate, narrow, costa gently arched, apex pointed, termen extremely obliquely rounded ; fuscous, faintly purplish-tinged, irrorated with dark fuscous ; a small pale greyish-ochreous spot close above tornus : cilia grey, somewhat sprinkled with whitish. Hindwings and cilia grey.

Nilgiris, 3,500 feet (Andrewes), N. Coorg (Newcome) ; in May and September ; three specimens.

Anchonoma, n. g.

Head with loosely appressed scales ; ocelli absent ; tongue developed. Antennæ $\frac{3}{4}$, in ♂ moderately fasciculate-ciliated ($1\frac{1}{2}$), basal joint moderately elongate, without pecten. Labial palpi long, recurved, second joint thickened with dense somewhat rough scales beneath, terminal joint as long as second, slender, acute. Maxillary palpi very short, filiform, appressed to tongue. Posterior tibiæ clothed with rough hairs above. Forewings with 2 and 4 long stalked, 3 absent, 5 closely approximated at base, 8 and 9 out of 7, 7 to apex, 11 from middle. Hindwings 1, elongate-ovate, cilia $\frac{1}{2}$; 3 and 4 stalked, 5-7 tolerably parallel.

Belongs to the group of *Eulechria*, but specially distinguished by the peculiar nervation of forewings.

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Anchonoma xeraula, n. sp.

♂ ♀. 21-28 mm. Head and thorax whitish-ochreous or pale greyish-ochreous, mixed with dark fuscous. Palpi whitish-ochreous, second and terminal joints variably sprinkled or suffused with dark fuscous except towards apex. Abdomen pale ochreous, sides tinged with fuscous. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen rounded, oblique; lower margin of cell sinuate and somewhat ridged beneath towards base, especially in ♂, a space above this tending to be thinly scaled; pale greyish-ochreous, suffusedly irrorated with dark fuscous; a small spot of dark fuscous suffusion on base of costa; stigmata cloudy, dark fuscous, first discal somewhat elongate, plical hardly beyond it, second discal approximated, in middle of wing; a cloudy pale subterminal line, sharply indented beneath costa, edged posteriorly with dark fuscous suffusion: cilia pale greyish-ochreous, with broad somewhat interrupted antemedian shade of dark fuscous suffusion. Hindwings light grey, paler and somewhat ochreous-tinged anteriorly; cilia grey-whitish, with grey subbasal line.

Khasis, in September; also from W. China; four specimens. Superficially very like *Borkhausenia pseudospretella*, and might be overlooked accordingly, though structurally very distinct.

Nephogenes fugax, n. sp.

♂ ♀. 21-22 mm. Head, palpi, antennæ, and thorax grey. Abdomen brownish-ochreous, segmental margins pale greyish-ochreous. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen extremely obliquely rounded; light grey, slightly brownish-tinged, irregularly sprinkled or irrorated with dark fuscous, sometimes forming lines on veins towards costa posteriorly; a spot of blackish irroration on base of costa; stigmata blackish, plical rather beyond first discal; a subterminal bent series of dots of black irroration close to termen and posterior part of costa: cilia light greyish, towards base sprinkled with dark fuscous. Hindwings light grey; cilia ochreous-grey-whitish.

Palni Hills, 6,000 feet (Campbell); three specimens. The genus *Nephogenes* is of some extent in Australia; this is the first species recorded elsewhere, but seems normal in every way. I have however a nearly allied species (undescribed) from Celebes.

Hypercallia pyrarcha, n. sp.

♂ ♀. 17-18 mm. Head yellow, a line on crown and spots on side of face and collar orange-reddish. Palpi pale yellow, second joint except towards apex ferruginous-orange sprinkled with fuscous, terminal joint with median band of orange and dark fuscous scales. Antennæ pale yellowish, suffused with grey towards apex, ciliations, in ♂ 3. Thorax yellow, irregularly streaked with orange-red. Abdomen grey. Forewings elongate-oblong, costa moderately arched, apex obtuse, termen sinuate, somewhat oblique; yellow, reticulated with orange-red; basal third of costa orange-red with three oblique dark fuscous streaks; two fasciæ of dark purplish-grey suffusion, first median, dilated towards dorsum so as to reach ½ and coalesce posteriorly with second, second

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broad, terminal, united with first by bar beneath costa so as to enclose in disc an orange-red roundish patch containing a yellow spot marked with a dark fuscous dot: cilia pale yellowish, with partial interrupted grey subbasal shade, at apex and towards tornus suffused with dark purple-grey. Hindwings grey, lighter anteriorly; cilia yellow-whitish, with pale greyish subbasal shade.

Khasis, in July; two specimens.

Therapnis, n. g.

Head with appressed scales; ocelli present; tongue developed. Antennæ $\frac{4}{5}$, in ♂ serrulate, minutely ciliated ($\frac{1}{3}$), basal joint moderately elongate, without pecten. Labial palpi long, recurved, second joint thickened with appressed scales, terminal joint shorter than second, slender, acute. Maxillary palpi short, filiform, appressed to tongue. Posterior tibiæ clothed with rough hairs above. Forewings with 2 from angle, 7 to costa, 8 absent, 11 from middle. Hindwings 1, elongate-ovate, cilia $\frac{1}{5}$; 4 absent, 5-7 tolerably parallel.

Apparently allied to *Sphyrelata*.

Therapnis parorma, n. sp.

♂ 12-13 mm., ♀ 14-16 mm. Head, antennæ, and thorax dark fuscous Palpi dark fuscous, slightly whitish-sprinkled, apex of joints whitish. Abdomen fuscous. Forewings elongate, costa gently arched, apex rounded-obtuse, termen very obliquely rounded; dark fuscous, base of scales ochreous-whitish; a curved blackish transverse line at $\frac{1}{6}$, followed by more or less whitish-ochreous suffusion often marked or tinged with reddish-ochreous, in ♂ expanded into a broad fascia not quite reaching costa; stigmata large, blackish, sometimes edged with whitish-ochreous or yellowish, plical rather beyond first discal, usually an additional smaller spot between and above discal, in ♂ obliterated with reddish-ochreous and merged in the pale costal patch following; a blackish interrupted line rising from costa at $\frac{2}{3}$, sinuate downwards and running to near apex, thence very near termen to dorsum before tornus, on costa preceded by a suffused whitish-ochreous patch, larger in ♂, and preceded in discal angulation by a smaller spot of whitish-ochreous or reddish-ochreous suffusion: cilia light fuscous, basal half sprinkled with dark fuscous or blackish. Hindwings rather dark grey: cilia grey.

Kegalle, Madulsima, Haputale, Kalutara, Matale, Ceylon (Alston, Pole Vaughan); from May to August, six specimens.

Erotis, n. g.

Head small, with appressed scales, ocelli present; tongue developed. Antennæ $\frac{5}{6}$, in ♂ serrulate, simple, basal joint moderate, with pecten of short scales. Labial palpi long, recurved, widely diverging, second joint reaching base of antennæ, somewhat expanded towards apex with rather rough scales, terminal joint shorter than second, slender, acute. Maxillary palpi short, filiform, appressed to tongue. Thorax rather swollen. Anterior tibiæ dilated with rough scales; posterior tibiæ clothed with rough hairs above. Forewings with 2 from about $\frac{5}{6}$, 3 from angle, 4 absent, 5 rather approximated to 3, 7 and

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8 stalked, 7 to costa, 9 from near 7, 10 remote, rising from $\frac{2}{3}$ of cell, 11 from $\frac{1}{3}$. Hindwings $\frac{4}{5}$, elongate-ovate, cilia $\frac{1}{5}$; 4 absent, 5 somewhat approximated to 3, 6 and 7 tolerably parallel.

A peculiar genus, of which the position must at present be considered quite doubtful. It can be regarded as an aberrant genus of *Oecophoridæ*, but it is possible that it should form a new family; the small head and swollen thorax, widely divergent palpi, and peculiar position of veins 10 and 11 of forewings are discordant characters which cause it to stand isolated.

Erotis phosphora, n. sp.

♂ ♀. 13-20 mm. Head, palpi, and antennæ ochreous-whitish. Thorax rose-pink spotted with dark grey irroration. Abdomen dark grey, sides and apex ochreous-whitish, basal segment suffused with pink. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen strongly rounded, oblique; rose-pink, irregularly strewn throughout with small spots of dark grey irroration; a streak of dark grey suffusion along costa from before middle to $\frac{3}{4}$; somewhat larger dark grey spots in disc at $\frac{1}{3}$ and $\frac{3}{4}$, and on dorsum at $\frac{2}{3}$: cilia rose-pink, with two lines of black points, basal third barred with dark grey irroration. Hindwings grey, thinly scaled and subhyaline in disc and towards base; cilia light grey.

Matale, Kegalle, Maskeliya, Kalutara, Ceylon (Alston, Pole); in July, November, and December; four specimens.

Macrosaces, Meyr.

The generic definition may be extended in the following points: labial palpi with second joint sometimes expanded towards apex, terminal sometimes longer than second; forewings with 3 sometimes present, stalked with 2 or separate; hindwings seldom with 5 absent.

Macrosaces negatella, Walk.

(*Gelechia negatella*, Walk, Cat. XXIX, 631.)

♂ ♀. 11-16 mm. Variable in depth of colouring, but always recognisable by the transverse blackish blotch on costa at $\frac{1}{3}$, reaching $\frac{2}{3}$ across wing. Hindwings varying from pale to dark grey.

Maskeliya, Pattipola, Ceylon (Pole, de Mowbray, Fletcher); from September to May.

Macrosaces amphiterma, n. sp.

♂ ♀. 10-14 mm. Head and thorax whitish-ochreous, irrorated with grey. Palpi ochreous-whitish, second joint considerably expanded with scales toward apex, sprinkled with dark fuscous, with a dark fuscous subapical band, terminal joint longer than second, with two dark fuscous bands. Antennæ whitish-ochreous ringed with fuscous. Abdomen grey, anal tuft whitish-ochreous. Forewings elongate, narrow, costa gently arched, apex obtuse, termen very obliquely rounded; 3 absent; whitish-ochreous, variably irrorated with fuscous, with some scattered black scales; a small blackish spot at base beneath costa, with a raised blackish tuft of scales beyond this; a somewhat oblique-transverse line of raised blackish scales at $\frac{2}{3}$, edged posteriorly

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with whitish-ochreous, on costa expanded into a triangular spot, in middle with a slight angular projection posteriorly; second discal stigma raised, blackish, more or less distinctly edged with whitish-ochreous or yellowish, and a similar dot beneath and rather beyond it; an indistinct cloudy waved whitish-ochreous line from $\frac{2}{3}$ of costa to dorsum before tornus, more or less edged anteriorly with dark fuscous irroration, its central third strongly curved outwards; a waved line of dark fuscous irroration running round posterior part of costa and termen: cilia whitish-ochreous mixed with fuscous and sprinkled with dark fuscous. Hindwings and cilia grey.

Maskeliya, Ceylon (Pole); in January and February, five specimens.

Macrosaces pendula, n. sp.

♂♀. 10-13 mm. Head and thorax whitish-ochreous irrorated with fuscous. Palpi ochreous-whitish, second joint moderately thickened, dark fuscous except apex, terminal joint as long as second, with dark fuscous band below middle. Antennæ whitish-ochreous ringed with fuscous. Abdomen fuscous. Forewings elongate, narrow, costa slightly arched, apex obtuse, termen very obliquely rounded; 3 absent; whitish-ochreous more or less irrorated with fuscous and dark fuscous; a blackish subcostal tuft towards base; a rather oblique transverse gently curved blackish line at $\frac{2}{3}$, tufted beneath costa and above dorsum, edged posteriorly with whitish-ochreous, expanded into a triangular blackish spot on costa and slightly sinuate near dorsum; second discal stigma raised, blackish, and a similar dot beneath and somewhat beyond it; an indistinct line of dark fuscous irroration or suffusion from $\frac{3}{4}$ of costa to dorsum before tornus, acutely angulated in middle; some indistinct dots of dark fuscous suffusion on posterior part of costa and termen; cilia pale fuscous, sprinkled with ochreous-whitish points and a few dark fuscous scales. Hindwings and cilia grey or pale grey.

Khasis; in October, five specimens. Very similar to *amphiterma*, but with the lines differently formed, and readily distinguished by the different marking and structure of palpi.

Macrosaces icteropa, n. sp.

♂♀. 11-14 mm. Head ochreous-yellow. Palpi light yellowish, second joint moderately thickened, somewhat sprinkled with dark fuscous except towards apex, terminal joint as long as second, with a dark fuscous ring near base. Antennæ pale yellowish ringed with dark fuscous. Thorax ochreous-yellowish sprinkled with fuscous. Abdomen rather dark fuscous, anal tuft pale ochreous mixed with fuscous. Forewings elongate, narrow, costa slightly arched, apex obtuse; termen very obliquely rounded; 3 absent; light ochreous-yellowish densely irrorated with dark fuscous; a blackish subcostal tuft towards base; stigmata raised, black, plical obliquely before first discal, these two with a spot on costa and a mark on dorsum appearing to form a rather curved oblique line interrupted in disc, an additional dot beneath and rather beyond second discal; a very indistinct transverse line of darker irroration from a black dot on costa at $\frac{2}{3}$, acutely angulated in middle: cilia fuscous

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suffused with whitish-ochreous at base, with three indistinct darker lines. Hindwings and cilia dark grey.

Khasis; in August and September, six specimens. Nearly allied to the two preceding, but the markings of the palpi are different from either; also characterised by the yellow head, dark general colouring, and discal interruption of first transverse line.

Macrosaces lucubrata, n. sp.

♂♀. 9-10 mm. Head and thorax whitish-ochreous irrorated with grey and fuscous. Palpi whitish-ochreous, second joint moderately thickened, irrorated with dark fuscous except at apex, with a blackish subapical ring, terminal joint as long as second, with a black band below middle. Antennæ whitish-ochreous ringed with dark fuscous. Abdomen grey, anal tuft whitish-ochreous. Forewings elongate, narrow, costa slightly arched, apex obtuse, termen very obliquely rounded; 3 absent; dark fuscous, base of scales whitish-ochreous; a small blackish spot at base beneath costa, and a black scaletuft beyond it edged posteriorly with whitish-ochreous; a nearly straight direct transverse raised black line at $\frac{3}{5}$, somewhat enlarged on costa, slightly sinuate above and below middle, strongly edged posteriorly with whitish-ochreous or yellowish; second discal stigma raised, black, strongly edged with whitish-ochreous or yellowish, and a similar spot beneath it, their pale margins usually confluent; a whitish-ochreous spot on costa at $\frac{3}{4}$, whence proceeds a very indistinct whitish-ochreous angulated transverse line, preceded by some blackish irroration; a cloudy waved line of blackish irroration along posterior part of costa and termen: cilia fuscous, sometimes mixed with dark fuscous, sprinkled with whitish-ochreous points, sometimes faintly barred with whitish-ochreous suffusion. Hindwings in ♂ grey or rather dark grey, in ♀ blackish grey; cilia grey.

Maskeliya, Peradeniya, Matale, Ceylon (Pole, Green); in July, August, December, and January; five specimens.

Macrosaces glebaria, n. sp.

♂♀. 11-14 mm. Head ochreous-yellowish, crown irrorated with dark fuscous. Palpi whitish-ochreous, second joint moderately thickened, dark fuscous except apex, terminal joint as long as second, with blackish subbasal ring. Antennæ whitish-ochreous, ringed or suffused with dark fuscous. Thorax dark fuscous. Abdomen ochreous-yellowish suffusedly banded with fuscous. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen very obliquely rounded; 2 and 3 short-stalked; dark fuscous, more or less sprinkled with whitish-ochreous; a small black spot at base beneath costa, and one on dorsum near base; a black subcostal tuft towards base; stigmata moderately large, raised, black, plical slightly before first discal, these two together with costal and dorsal black spots tending to form an interrupted rather bent transverse line, second discal sometimes pale-edged, with an additional spot beneath it; a pale ochreous-yellowish subtriangular blotch on costa about $\frac{3}{4}$, whence proceeds a very indistinct whitish-ochreous angulated

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line to dorsum before tornus: cilia fuscous somewhat mixed with dark fuscous, base suffused with whitish-ochreous. Hindwings in ♂ light fuscous, in ♀ rather dark fuscous; cilia light fuscous.

N. Coorg, 3,500 feet (Newcome); in June, October, and November, four specimens.

Macrosaces hemilyca, n. sp.

♂♀. 11-13 mm. Head and thorax rather dark fuscous, somewhat sprinkled with whitish-ochreous. Palpi whitish-ochreous sprinkled with blackish, second joint moderately thickened, terminal joint as long as second, with two broad blackish bands occupying nearly all of it. Antennæ whitish-ochreous more or less suffused with fuscous, and ringed with dark fuscous. Abdomen fuscous. Forewings elongate, narrow, costa slightly arched, apex obtuse, termen very obliquely rounded; 3 separate or short stalked with 2; dark fuscous, base of scales whitish-ochreous; a blackish subcostal tuft near base; a cloudy blackish raised rather curved direct transverse shade at $\frac{2}{3}$ edged posteriorly more or less widely with whitish-ochreous suffusion; second discal stigma raised, cloudy, blackish, with an additional less marked dot below it; a rather large spot of whitish-ochreous suffusion on costa about $\frac{3}{4}$, whence an indistinct angulated cloudy whitish-ochreous line runs to dorsum before tornus, edged anteriorly with blackish irroration: cilia fuscous mixed with darker, sometimes sprinkled with whitish-ochreous points, base whitish-ochreous. Hindwings rather dark fuscous, anterior half sometimes pale whitish-ochreous; cilia fuscous.

Palnis, 6,000 feet (Campbell); four specimens. The variation in the colour of hindwings is singular; it is not sexual, as the specimens include male and female of each form; and as the two forms agree in other respects, especially in the characteristic markings of the palpi, and are from the same locality, it is improbable that they are specifically distinct. I regard the form with the basa half of hindwings pale as being the type, and think the other form with hindwings wholly dark deserves a varietal name; I therefore name it var. *ecliptica*.

Macrosaces orphania, n. sp.

♂ 15-16 mm. Head pale ochreous, crown irrorated with dark fuscous. Palpi whitish-ochreous, second joint moderately thickened, irrorated with dark fuscous except at apex, terminal joint as long as second, with dark fuscous subbasal and subapical rings. Antennæ whitish-ochreous ringed with dark fuscous. Thorax dark fuscous, base of scales whitish-ochreous. Abdomen pale ochreous mixed with fuscous. Forewing elongate, narrow, posteriorly dilated, costa gently arched, apex obtuse, termen very obliquely rounded; 2 and 3 short-stalked; whitish-ochreous more or less densely irrorated with fuscous and dark fuscous, sometimes suffused with fuscous; a dark fuscous subcostal tuft towards base; a rather curved cloudy dark fuscous transverse raised line at $\frac{2}{3}$, indistinctly edged with whitish-ochreous posteriorly nearly straight from below costa to below middle; second discal stigma

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blackish, raised, obscurely pale-edged, and a similar spot beneath and hardly beyond it ; a faint cloudy line of darker irroration from $\frac{2}{5}$ of costa to dorsum before tornus, posteriorly faintly pale-edged, angulated in middle and indented above this : cilia fuscous, with pale base and darker subbasal shade. Hindwings and cilia grey.

♀. 15 mm. Palpi with second joint dark fuscous except apex, dark rings of terminal joint broader. Forewings with ground colour dark fuscous, markings blackish, first line posteriorly edged with whitish-ochreous. Hindwings becoming dark grey posteriorly.

Palnis, 6,000 feet (Campbell) ; five specimens. Immediately distinguished from *hemilyca* by the absence of the pale blotch on costa posteriorly ; the distinct dilation of the forewings is also a special characteristic.

Macrosaces crocozona, n. sp.

♂♀. 9-10 mm. Head, thorax and abdomen dark grey. Palpi dark grey anterior edge and apex of joints yellowish. Antennæ dark grey, obscurely dotted with pale yellowish. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen very obliquely rounded ; 3 present, separate ; ashy-grey irrorated with blackish ; a short yellow subcostal dash towards base ; three ochreous-yellow direct transverse fasciæ, first at $\frac{1}{3}$, moderately broad, usually narrowed on costa, posterior edge rather prominent in middle, second narrow, enclosing raised black second discal stigma and a similar dot beneath it, and reaching dorsum, but not costa, third narrow, running from about $\frac{3}{4}$ of costa to tornus, sometimes somewhat dilated in disc : cilia grey, sprinkled with black on basal half. Hindwings with 5 absent ; grey ; cilia grey.

Khasis, from July to October ; five specimens. This species differs from all the rest in the absence of vein 5 of hindwings, but, though very distinct, it is at the same time so obviously allied that generic separation is not called for.

Eutorna, Meyr.

A distinct genus, hitherto represented by ten Australian and two New Zealand species, with which the following species has close affinity.

Eutorna insidiosa, n. sp.

♂♀. 10-13 mm. Head and thorax ochreous, face whitish-ochreous. Palpi pale ochreous, scales of second joint loosely expanded above towards apex. Antennæ whitish-ochreous, dotted with dark grey. Abdomen grey, segmental margins suffused with ochreous-whitish. Forewings elongate, rather narrow, costa anteriorly moderately, posteriorly slightly arched, apex rounded-obtuse, termen extremely obliquely rounded ; deep ochreous ; costal edge blackish towards base ; a broad ferruginous-brown streak beneath fold from base to tornus, suffused beneath and posteriorly, edged above with some black scales and then with whitish suffusion ; a triangular patch of ferruginous-brown suffusion extending on costa from $\frac{2}{5}$ to near apex and reaching half across wing, edged anteriorly by a very oblique ochreous-whitish streak preceded towards costa by some blackish irroration, and enclosing a shorter similar streak from costa at $\frac{3}{4}$, second discal stigma round, black, edged with ochreous-

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whitish ; some blackish scales along termen : cilia ochreous-whitish, with two suffused brown shades. Hindwings rather dark grey ; cilia grey.

Khasis, from August to October ; ten specimens.

Pseudodoxia melanœma, n. sp.

♂ ♀. 12-13 mm. Head, palpi, antennæ, thorax, and abdomen dark purplish-fuscous. Forewings elongate, narrow, costa gently arched, apex obtuse, termen very obliquely rounded ; dark purplish-fuscous : cilia rather dark fuscous. Hindwings dark fuscous ; cilia rather dark fuscous.

Khasis, in July and August ; six specimens.

Pseudodoxia placida, n. sp.

♂ ♀. 13-16 mm. Head and thorax light fuscous, forehead sometimes tinged with whitish-ochreous. Palpi fuscous, apex of joints more or less tinged with whitish-ochreous. Antennæ fuscous. Abdomen grey, anal tuft, ochreous-whitish. Forewings elongate, rather narrow, costa moderately arched, apex tolerably pointed, termen extremely obliquely rounded ; light fuscous sprinkled with darker, sometimes suffused with darker along costa ; stigmata blackish, plical beneath first discal ; sometimes some indistinct dark fuscous marginal dots round apex : cilia fuscous, sprinkled with whitish points, base paler. Hindwings grey ; cilia rather light grey, base pale ochreous.

Madulsima, Ceylon (Vaughan) ; from April to June, ten specimens.

Pseudodoxia triastis, n. sp.

♂. 17-21 mm. Head whitish-ochreous. Palpi whitish-ochreous, second joint suffused with dark fuscous except apex, terminal joint sometimes with some dark fuscous scales towards base. Antennæ whitish-ochreous tinged with fuscous. Thorax whitish-ochreous suffused anteriorly with fuscous. Abdomen grey, anal tuft whitish-ochreous. Forewings elongate, rather narrow, costa moderately arched, apex obtuse, termen very obliquely rounded; whitish-ochreous, sometimes tinged with fuscous, more or less irregularly and suffusedly irrorated with fuscous and dark fuscous ; stigmata rather large, blackish-fuscous, plical beneath first discal ; some more or less marked large cloudy blackish-fuscous dots round posterior part of costa and upper part of termen : cilia whitish-ochreous more or less suffused with light fuscous. Hindwings grey ; cilia whitish-ochreous more or less suffused with grey.

♀. Head and thorax usually suffused with fuscous. Palpi with terminal joint more or less irrorated with dark fuscous except towards apex. Forewings usually almost wholly suffused with light fuscous and irrorated with dark fuscous ; markings as in ♂. Hindwings and cilia grey.

Madulsima, Maskeliya, Patipola, Ceylon (Vaughan, Pole, Alston) ; from December to June ; twenty-five specimens. There is considerable variability in the development of the dark suffusion, and the sexes are normally dissimilar, the ♀ being so much darker, but the darkest ♂ is hardly distinguishable from the lightest ♀. Nearly all my examples are from Madulsima, where Mr. Vaughan takes the species in plenty. *P. placida*, which occurs with it, is smaller, and can always be distinguished by the pointed forewings.

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Pseudodoxia pinarodes, n. sp.

♂. 14-16 mm. Head and thorax whitish-ochreous or pale greyish-ochreous. Palpi dark fuscous, terminal joint ochreous-whitish towards apex. Antennæ whitish-ochreous, more or less suffused with fuscous. Abdomen whitish-ochreous sprinkled with fuscous. Forewings elongate, costa moderately arched, apex obtuse, termen very obliquely rounded ; pale greyish-ochreous, sprinkled with fuscous and dark fuscous, especially towards costa and posteriorly ; stigmata large, blackish, plical beneath first discal ; sometimes some cloudy dark fuscous dots round posterior part of costa and upper part of termen : cilia pale greyish-ochreous, sometimes mixed with fuscous. Hindwings varying from pale fuscous to grey ; cilia pale greyish-ochreous, sometimes with suffused fuscous subbasal shade.

Maskeliya, Ceylon (Pole); in January, ten specimens. Smaller than *P. triastis*, with the forewings shorter and broader, and costa somewhat more arched.

Pseudodoxia cryptias, n. sp.

♂ ♀. 14-16 mm. Head and thorax grey. Palpi whitish-ochreous suffusedly irrorated with dark grey except at apex of joints. Antennæ dark grey. Abdomen dark grey, sides of anal segment suffused with ochreous-whitish. Forewings elongate, rather narrow, costa gently arched, apex round-pointed, termen extremely obliquely rounded ; grey, irrorated with dark grey ; second discal stigma sometimes perceptible, dark grey : cilia grey, sometimes mixed with darker, sprinkled with pale points. Hindwings and cilia in ♂ grey, in ♀ dark grey.

Madulsima, Ceylon (Vaughan, Green) ; in May and June, five specimens.

Pseudodoxia agoræa, n. sp.

♂. 14 mm. Head whitish-ochreous. Palpi ochreous-whitish, second joint blackish-grey except apex. Antennæ pale greyish-ochreous becoming grey towards base. Thorax grey suffused with blackish anteriorly. Abdomen whitish-ochreous. Forewings elongate, very narrow, costa slightly arched, apex round-pointed, termen extremely obliquely rounded ; grey, sometimes slightly whitish-sprinkled, or posteriorly sprinkled with fuscous ; base of costa suffused with blackish ; stigmata rather large, black, plical rather before first discal ; sometimes some cloudy blackish marginal dots round apex : cilia pale grey, sprinkled with darker and whitish points. Hindwings grey, rather thinly scaled in disc and towards base ; cilia pale grey.

Maskeliya, Ceylon (Pole) ; in February, two specimens. Allied to *seposi tella*, but distinguished by the small size and very narrow forewings.

Pseudodoxia picrophœa, n. sp.

♂ ♀. 17-21 mm. Head and thorax dark fuscous, irrorated with whitish. Palpi whitish, suffusedly irrorated with dark fuscous except towards apex of joints. Antennæ fuscous. Abdomen whitish-ochreous irrorated with grey. Forewings elongate, narrow, costa gently arched, apex round-pointed, termen extremely obliquely rounded ; fuscous, more or less irregularly sprinkled with

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darker, sometimes finely irrorated with whitish ; stigmata large, dark fuscous, plical rather before first discal ; some cloudy dark fuscous marginal dots round apex : cilia pale fuscous, more or less mixed with darker, and irrorated with pale points. Hindwings grey ; cilia pale greyish-ochreous, with faint fuscous subbasal shade.

Hakgala, Ceylon (Green) ; in March and April, three specimens. Larva eeding in a portable case on lichens growing on trunks and rocks (Green) ; ase 27-31 mm. long, formed of silk covered with fragments of lichen, acutely pering posteriorly, anterior half covered by an ovate hood, 10-12 mm. broad, tending as a ragged edge to below middle. The hood in this species is ger and more extensive than in *sepositella*, in which it does not reach mid- of case, and much more so than in *limulus* and *cretata*, in which the hood rs only a small proportion to the length of the long slender acute posterior tion.

eudodoxia sepositella, Walk.

vas in error in referring *limulus* Durr. to this species as a synonym ; the t names indicate two very closely allied but distinct species ; my previous no eferred to the true *limulus*. *P. sepositella* is larger (18-21 mm.), grey or dar rey, without dark irroration but often somewhat whitish-sprinkled, with a b spot beneath costa near base, stigmata large, black, plical rather before first scal, with faint pale nearly straight subterminal line indented in middle, and ck marginal dots ; head pale ochreous-yellowish, thorax grey suffused with ackish anteriorly.

Maliya, Ceylon (Pole) ; in January, February, and July, seven specimens. Larva feeding like *limulus* ; case intermediate in character between those *limulus* and *picrophœa*.

Pseudoxia ichnœa, n. sp.

♀. 17 mm. Head and thorax pale greyish-ochreous with some scattered dark fus scales. Palpi whitish-ochreous, second joint irrorated with dark fuscous cept base and apex. Antennæ pale greyish-ochreous. Abdomen grey, an segment ochreous-whitish. Forewings elongate, narrow, costa gently arched ex round-pointed, termen extremely obliquely rounded ; light fuscous sprinkl with dark fuscous ; stigmata moderate, blackish-fuscous, plical obliquely efore first discal ; a series of large cloudy blackish-fuscous dots round termer and posterior part of costa : cilia fuscous irrorated with pale greyish-ochreos. Hindwings dark grey ; cilia light greyish-ochreous.

Peraeniya, Ceylon (Green) ; in February, two specimens. Larva feeding in the me way as the two preceding species (Green) ; case generally similar to that f *picrophœa* but smaller (length 20-23 mm., breadth of hood 8-9 mm.), hood etended as a diminishing wing to well below middle of case.

Psalca, Meyr.

The eneric characters, originally drawn from a single specimen, require to be amnded in the following particulars : Antennæ in ♂ 1, in ♀ shorter ; forewigs with 2 from $\frac{5}{6}$, 3 from angle. The genus is structurally near

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Pseudodoxia, from which it is distinguished by vein 7 of forewings running to termen.

Psaltica monochorda, Meyr.

♂ ♀. 12-16 mm. Head light yellowish, sometimes tinged with brownish. Palpi pale yellowish, second joint varying from brownish to dark fuscous. Forewings with anterior half brown or dark brown, white median line variable, nearly straight or rather curved, often followed by a fascia of pale yellowish, suffusion, discal black dot usually on posterior edge of this fascia, but sometimes within it if broad, apical area beyond this more or less suffused with brown. Hindwings varying from pale to dark grey.

Maskeliya, Madulsima, Peradeniya, Ceylon (Pole) ; from August to May, sixteen specimens. A variable species ; the above notes are supplementary to the original description.

Psaltica toxophanes, n. sp.

♂. 13 mm. Head, antennæ, and thorax fuscous, crown suffused with ochreous-yellowish. Palpi dark fuscous, terminal joint whitish-ochreous. Abdomen grey, anal tuft ochreous-yellowish. Forewings elongate, rather narrow, costa gently arched, apex rounded-obtuse, termen very obliquely rounded; glossy ochreous-fuscous, with a faint purplish tinge; an incurved pale ochreous-yellowish fascia at $\frac{2}{3}$, anterior edge sharply defined, posterior suffused : cilia fuscous. Hindwings grey ; cilia pale fuscous tinged with yellowish.

Khasis ; in July, one specimen. Much blunter-winged than the preceding, without white line or black dot.

Psaltica xanthochra, n. sp.

♂. 10 mm. Head, palpi, and thorax yellow-ochreous. Antennæ greyish. Abdomen grey, anal tuft ochreous-yellowish. Forewings elongate, costa gently arched, apex obtuse, termen very obliquely rounded ; glossy ochreous-brown, with a faint lilac tinge ; a straight whitish line crossing wing at $\frac{3}{4}$, carrying the small black second discal stigma on its posterior edge, followed by a fascia of deep yellow suffusion, becoming much broader towards costa, apical area beyond this tinged with deep yellow : cilia ochreous-yellow Hindwings rather dark grey ; cilia light grey tinged with yellowish.

Puttalam, Ceylon (Pole) ; two specimens. Distinguished from *P. monochorda* by the smaller size, deep yellow suffusion, more obtuse forewings, and black discal dot resting on white line instead of beyond it.

Eupselia, Meyr.

A genus of about fourteen Australian species, hitherto not found elsewhere. It is allied to *Psaltica*, but differs by the shorter antennæ, which are not lengthened or thickened in ♂, and coincidence of veins 7 and 8 of forewings (7 to costa, 8 absent). The following species agrees well in character with the typical Australian forms.

Eupselia isacta, n. sp.

♂ ♀. 13-14 mm. Head, palpi, and thorax ochreous-yellow, sides of face and shoulders ferruginous. Antennæ whitish-ochreous. Abdomen ochreous-

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yellowish tinged with grey. Forewings elongate, costa moderately arched, apex obtuse, termen very obliquely rounded ; ochreous-yellow ; base of costa ferruginous, edge sometimes dark fuscous ; a dark brown transverse median fascia, anterior edge suffused into ground colour, posterior sharply limited by a white line ; more or less brownish suffusion towards termen : cilia ochreous-yellow, towards tornus tinged with brownish. Hindwings fuscous or dark fuscous ; cilia light greyish-ochreous, more or less tinged with fuscous.

Cuddapah, 4,000 feet (Campbell) ; N. Coorg, 3,500 feet (Newcome) ; in June, five specimens.

Leptosaces, Meyr.

This genus, founded on a New Zealand species, differs from *Cryptolechia* by the costal termination of vein 7 of forewings. Whilst maintaining it for present convenience, I think that it may, however, be ultimately merged in *Cryptolechia*.

Leptosaces phœbas, Meyr.

(*Eulechria phœbas*, Meyr. Journal, Bombay Natural History Society, XVII., 742.)

Described from females only, but having obtained both sexes commonly, I find that the species is referable here, the antennæ in ♂ being only minutely ciliated.

Khasis : from May to October.

Leptosaces anticentra, n. sp.

♂ ♀. 13-14 mm. Head and thorax deep ochreous-yellow, shoulders suffused with dark fuscous. Palpi ochreous-yellow, somewhat sprinkled with dark fuscous. Antennæ pale yellowish, suffusedly ringed with dark fuscous. Abdomen grey, anal tuft whitish-ochreous. Forewings elongate, costa gently arched, apex round-pointed, termen slightly rounded, very oblique ; deep ochreous-yellow, sprinkled with dark fuscous ; base of costa suffused with dark fuscous ; stigmata dark fuscous, plical rather beyond first discal, second discal merged in a narrow dark fuscous fascia running from a triangular costal spot at $\frac{2}{3}$ to tornus, where it unites with a dark fuscous terminal fascia, which is rather broad on costa and irregularly attenuated downwards : cilia ochreous-yellow, with dark grey patches above apex and on tornus. Hindwings grey, darker in ♀ : cilia pale grey, with darker subbasal shade.

Khasis ; in May, four specimens. Very like *facunda*, but larger and more strongly marked, and easily recognised by the position of the plical stigma which is obliquely beyond first discal instead of before it.

Leptosaces facunda, n. sp.

♂ ♀. 11-12 mm. Head, palpi, and thorax deep ochreous-yellow, shoulders dark fuscous. Antennæ light yellowish, ringed in ♂ with grey, in ♀ with dark fuscous except towards base. Abdomen grey, anal tuft ochreous-yellowish. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen very obliquely rounded ; deep ochreous-yellow ; a streak of

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rather dark fuscous suffusion along basal third of costa ; stigmata blackish, plical rather before first discal, an additional dot beneath second discal ; a spot of rather dark fuscous suffusion on middle of costa, reaching second discal stigma ; a moderately broad rather dark fuscous terminal fascia, rather prominent in disc so as to touch second discal stigma and dot beneath it : cilia ochreous-yellow, on tornus fuscous. Hindwings grey ; cilia whitish-yellowish, tinged with grey towards base.

Khasis ; in June, four specimens.

Leptosaces matœa, n. sp.

♂ ♀. 15-17 mm. Head and thorax whitish-ochreous. Palpi ochreous-whitish, second joint brownish or fuscous except apex. Antennæ whitish-ochreous, dotted with fuscous except towards base. Abdomen whitish-ochreous tinged with grey. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen very obliquely rounded ; whitish-ochreous : cilia concolorous. Hindwings grey ; cilia ochreous-whitish tinged with grey towards base.

Cuddapah, 4,000 feet (Campbell) ; three specimens.

Periacma, Meyr.

The original diagnosis should be corrected or extended in the following particulars. Antennæ $\frac{4}{5}$ to nearly 1, in ♂ simple, rather thick. Labial palpi in ♂ with basal joint somewhat lengthened, second joint greatly elongate, moderately stout, smooth-scaled, pointed, terminal joint absent, in ♀ with second joint normal, long, terminal as long as second or shorter, slender, acute. Forewings with 2 and 3 sometimes stalked, 7 to apex or sometimes termen.

Having now plenty of material for dissection, I find that the ♂ palpi are really two-jointed, the greatly elongate joint, which I supposed to be the terminal, being really the second, whilst the terminal is wholly absent ; when the palpus is denuded, there appears to be not even a rudiment of it. The long second joint, though somewhat pointed, is not slender, and acute like the true terminal. As further evidence that it is really the terminal joint which is absent, it may be noticed that in such species as *scrupulosa* and *metrica*, where the second joint in the ♀ bears a black subapical ring, this same ring will be found in the ♂ beneath the apex of the elongate joint, clearly indicating its homology. This curious palpus, which is unique and cannot be mistaken for that of any other *Lepidoptera*, is alike in all the nineteen described species, and forms the distinguishing mark of the genus. Besides the three species previously described, *Phœosaces torrida*, Meyr. is properly referable here.

Periacma contraria, n. sp.

♂ 15 mm. Head, palpi, antennæ, and thorax whitish-ochreous. Abdomen pale grey, anal tuft whitish-ochreous. Forewings elongate, costa gently arched, apex round-pointed, termen extremely obliquely rounded ; 7 to termen ; whitish-ochreous, anteriorly tinged with yellow-ochreous, with a few scattered

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blackish specks; a small spot of fuscous suffusion on base of costa; discal stigmata moderate, black, plical absent, but an additional dot beneath second discal; several minute blackish dots on posterior part of costa and termen: cilia whitish-ochreous. Hindwings whitish-grey; cilia ochreous-whitish.

Nilgiris, 6,000 feet (Andrewes); in May, two specimens.

Periacma scrupulosa, n. sp.

♀♂ 16-18 mm. Head whitish-ochreous. Palpi ochreous-whitish, sprinkled with black except apex of second and base and apex of terminal joint, second joint with blackish subapical ring. Antennæ ochreous-whitish, ringed with dark fuscous. Thorax whitish-ochreous sprinkled with blackish. Abdomen whitish-ochreous, dorsally suffused with grey. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen very obliquely rounded; 7 to apex; pale greyish-ochreous, sprinkled with fuscous and blackish; a blackish dot on base of costa, one in middle of base, and one beyond and between these; stigmata cloudy blackish, plical rather beyond first discal; cloudy blackish costal dots on veins 8-12: cilia pale fuscous irrorated with whitish-ochreous, along costa and on basal third along termen whitish-ochreous barred with blackish. Hindwings light grey; cilia whitish-ochreous with faint greyish subbasal shade.

Maskeliya, Ceylon (Pole); in January, three specimens.

Periacma metrica, n. sp.

♂♀ 16-19 mm. Head and thorax whitish-ochreous, shoulders blackish. Palpi ochreous-whitish, somewhat sprinkled with blackish, second joint with black subapical ring. Antennæ whitish-ochreous, sometimes tinged with fuscous. Abdomen whitish-ochreous, sprinkled with grey. Forewings elongate, somewhat dilated posteriorly, costa gently arched, apex obtuse, termen very obliquely rounded; 7 to apex; pale greyish-ochreous, sprinkled with blackish; a black dot on base of costa, one in middle of base, and one beyond and between these; stigmata black, plical slightly beyond first discal; a more or less developed longitudinal streak of blackish irroration above middle, hardly traceable anteriorly, usually distinct from above second discal stigma to beneath costa before apex, where it forms a cloudy blackish spot; a series of blackish dots round posterior half of costa and termen: cilia pale fuscous irrorated with whitish-ochreous, basal third more or less spotted with blackish, on costa with two entire blackish bars before apex. Hindwings pale grey; cilia whitish-ochreous.

Maskeliya, Ceylon (Pole); in January, April, May, August and October; ten specimens. Closely allied and very similar to the preceding species, but differs by the distinctly broader fore and hind wings, the forewings somewhat dilated posteriorly, the presence of the dark streak or at least spot beneath costa posteriorly, and the antennæ not ringed with dark fuscous.

Periacma limosa, n. sp.

♂♀ 14-20 mm. Head, palpi, antennæ, and thorax light brownish-ochreous. Abdomen grey, anal tuft pale ochreous. Forewings elongate, costa gently arch-

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ed, apex obtuse, termen obliquely rounded ; 7 to apex : light ochreous, suffusedly irrorated with brownish or fuscous ; stigmata large, cloudy, indistinct, fuscous, plical hardly beyond first discal ; sometimes an indistinct cloudy spot of fuscous suffusion towards apex : cilia light brownish-ochreous, sometimes with indications of fuscous spots. Hindwings grey ; cilia light grey, with two faint darker shades.

Maskeliya, Kegalle, Polgahawela, Puttalam, Trincomali, Ceylon (Pole, Alston, Green) ; in May, and from October to December, twelve specimens.

Periacma byrsodes, n. sp.

♂ 20 mm. Head pale greyish-ochreous. Palpi pale greyish-ochreous, irrorated with blackish. Antennæ and thorax pale greyish-ochreous irrorated with fuscous. Abdomen pale greyish-ochreous, irrorated with grey. Forewings elongate, costa moderately arched, apex obtuse, termen somewhat sinuate, rather oblique ; 7 to apex ; fuscous sprinkled with pale ochreous and blackish ; stigmata large, cloudy, very indistinct, formed of dark fuscous irroration, plical hardly beyond first discal, from second discal a streak of rather dark fuscous suffusion runs to submedian fold before tornus ; a dark fuscous terminal line : cilia whitish-ochreous, with traces of an interrupted fuscous median shade. Hindwings grey ; cilia as in forewings.

Hakgala, Ceylon (Green) ; in May, one specimen.

Periacma pentachora, n. sp.

♂ 16-20 mm. Head, thorax, and abdomen whitish-ochreous, shoulders dark fuscous. Palpi ochreous-whitish, basal joint and base of second irrorated with dark fuscous, second joint with a dark fuscous subapical dot. Antennæ whitish-ochreous more or less suffused with fuscous, becoming dark fuscous towards base. Forewings elongate, slightly dilated posteriorly, costa gently arched, apex obtuse, termen straight, oblique ; 7 to apex ; whitish-ochreous, suffused with pale yellow-ochreous towards margins ; a moderate blackish spot on base of costa ; stigmata blackish, plical slightly beyond first discal, another dot between and above discal, and a fifth near beneath second discal ; suffused dark fuscous spots on costa at $\frac{1}{3}$, $\frac{2}{3}$, :towards apex, and on tornus, variable in development and sometimes in part almost obsolete : cilia whitish-ochreous. Hindwings whitish-ochreous tinged with grey ; cilia whitish-ochreous.

Palni Hills (Campbell) ; two specimens.

Periacma turbulenta, n. sp.

♂ ♀ 18-21 mm. Head and thorax light ochreous-yellowish, thorax anteriorly more or less widely suffused with dark fuscous. Palpi pale ochreous-yellowish, second joint sprinkled with fuscous. Antennæ whitish-ochreous, more or less suffused with fuscous. Abdomen light grey, anal tuft light ochreous-yellowish. Forewings elongate, posteriorly slightly dilated, costa gently arched, apex obtuse, termen faintly sinuate, oblique ; 7 to apex; light ochreous-yellowish, irregularly sprinkled with brownish ; a broad streak of darker brown irroration or suffusion along costa from base to $\frac{4}{5}$, including a dark, fuscous

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patch on base of costa; stigmata dark, fuscous, plical rather beyond first discal, discal connected by a pale yellowish streak, second large; a more or less developed triangular patch of dark fuscous suffusion on tornus, extending along termen to apex, its angle touching second discal stigma: cilia light ochreous-yellowish, on costa and at apex barred with dark brown suffusion, on termen sometimes with interrupted brownish antemedian shade. Hindwings light grey, in ♂ more or less suffused with whitish-ochreous; cilia whitish-ochreous, with two more or less indistinct grey shades.

Khásis; in September and October, seven specimens.

Periacma ceroplasta, n. sp.

♂♀ 18-24 mm. Head and thorax light ochreous-yellowish, shoulders suffused with dark fuscous. Palpi in ♂ whitish-ochreous with a few fuscous scales; in ♀ with rough expanded hairs towards apex of second joint above, light ochreous-yellowish sprinkled with dark fuscous. Antennæ whitish-ochreous obscurely ringed with dark fuscous. Abdomen whitish-ochreous tinged with grey. Forewings elongate, somewhat dilated posteriorly, costa gently arched, apex round-pointed, termen sinuate, oblique; 7 to termen; light ochreous-yellowish, usually with some scattered fuscous or dark fuscous scales; a broad undefined costal streak of fuscous irroration from base to middle; sometimes some fuscous suffusion towards middle of dorsum; stigmata black, plical obliquely beyond first discal, an additional dot close beneath second discal and sometimes connected with it; a patch of dark fuscous suffusion on costa at $\frac{2}{3}$; a more or less developed terminal fascia of fuscous or dark fuscous suffusion, triangularly dilated beneath so as to touch dot beneath second discal stigma: cilia light ochreous-yellowish, with more or less developed subbasal series of fuscous spots, above apex and at tornus with patches of dark fuscous suffusion. Hindwings light fuscous, more or less suffused with whitish-ochreous; cilia whitish-ochreous, with faint greyish subbasal shade.

Palni Hills, 6,000 feet (Campbell); four specimens.

Periacma chelonias, n. sp.

♂♀. 14-19 mm. Head and thorax deep ochreous-yellow, sides of crown and shoulders variably suffused with dark purplish-fuscous. Palpi ochreous-yellow, second joint with dark fuscous almost apical band, in ♀ with scales somewhat expanded above towards apex, terminal joint in ♀ $\frac{1}{3}$. Antennæ whitish-ochreous more or less suffused with fuscous. Abdomen grey. Forewings elongate, costa gently arched, apex round-pointed, termen faintly sinuate, oblique, more so in ♀; deep ochreous-yellow, sometimes tinged with brownish or sprinkled with dark fuscous; markings dark purplish-fuscous; a thick streak along costa from base to beyond middle; stigmata well-marked, plical hardly beyond first discal, these two often included in a rather broad transverse fascia of dark suffusion; a variable spot on costa at $\frac{2}{3}$ often connected with second discal stigma; a moderate terminal fascia, triangularly dilated beneath so as to touch second discal stigma; cilia ochreous-

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yellow with dark fuscous patches above apex and on tornus. Hindwings grey; cilia light grey, becoming pale yellowish on upper part of termen.

Maskeliya, Peradeniya, Ceylon (Pole, Green, de Mowbray); from February to October, eleven specimens. The short terminal joint of palpi in ♀ is a special character. I have a large ♀ specimen, in which the whole forewing is suffused with rather dark fuscous, except a yellow streak on costa posteriorly, the cilia yellow as usual; it is probably a variety of this species; in colouring it recalls *melicrossa*, but is not so dark, and differs in palpi and form of wing.

Periacma melicrossa, n. sp.

♂♀. 14-16 mm. Head ochreous-yellow. Palpi ochreous-yellow, second joint with dark fuscous subapical ring, in ♀ with scales somewhat expanded above towards apex. Antennæ pale yellowish, suffusedly dotted with fuscous. Thorax and abdomen dark fuscous, anal tuft in ♂ mixed with pale yellowish. Forewings elongate, costa gently arched, apex obtuse, termen straight, oblique; 7 to just below apex; dark fuscous, in ♂ somewhat suffused with ochreous except towards costa and posteriorly, with a spot of yellow suffusion on costa beyond middle, stigmata perceptible, darker fuscous, in ♀ all these absent except a few yellowish scales on costa beyond middle; a deep yellow mark long costa towards apex: cilia ochreous-yellow, with a bar above apex and tornal patch blackish-grey. Hindwings dark grey; cilia grey, with darker subbasal shade.

Coorg, 3,500 feet (Newcome); from May to August, five specimens.

Periacma laganopa, n. sp.

♂♀. 16-19 mm. Head and palpi ochreous-yellow. Antennæ fuscous, beneath pale yellowish. Thorax ochreous-fuscous. Abdomen grey, anal tuft yellow-ochreous. Forewings elongate, costa gently arched, apex obtuse, termen slightly sinuate, oblique; 7 to termen; light yellow-brownish; stigmata dark fuscous, plical slightly beyond first discal; a suffused fuscous wedgeshaped mark from tornus touching second discal: cilia brownish-yellowish, on tornus sometimes with a brown patch. Hindwings rather thinly scaled, grey; cilia greyish-yellowish.

Khásis; in June and July, three specimens.

Periacmia haliphœa, n. sp.

♂♀. 14-16 mm. Head deep ochreous-yellow. Palpi ochreous-yellow, in ♂ more or less tinged with whitish. Antennæ dark grey. Thorax lilac-fuscous. Abdomen dark grey, anal tuft ochreous-yellowish. Forewing elongate, costa gently arched, apex obtuse, termen straight, oblique; 7 to termen; lilac-fuscous; second discal stigma sometimes obscurely darker: cilia ochreous-yellowish, towards apex and tornus suffused with brownish. Hindwings rather dark grey; cilia ochreous-yellowish.

Khásis; from July to September, eleven specimens.

Periacmia isomora, n. sp.

♂. 22 mm. Head deep ochreous-yellow. Palpi ochreous-yellow, second joint with black subapical ring. Antennæ dark grey. Thorax and abdomen

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dark fuscous. Forewings elongate, costa gently arched, apex obtuse, termen faintly sinuate, oblique ; 7 to just below apex ; dark fuscous ; second discal stigma and a suffused streak connecting it with tornus very obscurely darker : cilia dark fuscous. Hindwings dark fuscous ; cilia fuscous, with darker subbasal shade.

Khasis ; in May, one specimen.

Periacma conophanta, n. sp.

♂ ♀. 14-16 mm. Head, palpi, antennæ, thorax, and abdomen dark fuscous ; lower part of face and base of palpi in ♂ suffused with whitish-ochreous, tip of palpi in ♀ whitish ; anal tuft mixed with whitish-ochreous. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen straight, oblique ; 7 to apex ; dark purplish-fuscous ; stigmata obscurely darker, plical rather beyond first discal ; a small triangular ochreous-whitish spot on costa about $\frac{3}{4}$: cilia dark fuscous. Hindwings dark fuscous ; cilia fuscous.

Madulsima, Peradeniya, Maturatta. Ceylon (Green, Pole) ; Khasis ; from March to September, ten specimens.

Periacma iodesma, n. sp.

♂ ♀. 17-19 mm. Head and thorax orange. Palpi orange, second joint in ♂ with dark fuscous streak anteriorly except towards base. Antennæ grey, beneath whitish-ochreous. Abdomen grey, anal tuft pale ochreous-yellowish. Forewings elongate, costa gently arched, apex obtuse, termen obliquely rounded ; 7 to apex ; orange ; markings dark purplish-fuscous ; a dot on base of costa ; an irregular spot on base of dorsum ; a streak along fold from near base to middle of wing, sometimes connected with preceding ; a rather elongate mark above this, representing first discal stigma ; a rather narrow fascia from costa beyond middle to dorsum before tornus, where it unites with a similar more irregular-edged fascia running round apex and termen cilia orange, becoming paler towards tips, beneath tornus grey. Hindwings grey ; cilia pale yellowish, with indistinct grey subbasal shade.

Khasis ; in May and June, twenty specimens. Closely allied to *orthiodes*, but the latter species is smaller and paler, and entirely without the dark fuscous streak on palpi of ♂. Before recognising its distinctness I sent specimens of the present species under the name of *orthiodes* to some of my correspondents, who are hereby requested to correct the error ; the type of *orthiodes* is from Burma, and still unique.

Mesothyrsa, n. g.

Head with appressed scales, side-tufts loosely spreading ; ocelli present ; tongue developed. Antennæ $\frac{5}{6}$, in ♂ rather stout, simple, basal joint moderate, without pecten. Labial palpi very long, recurved, second joint very long, densely scaled, with rough expanded hairs above towards apex, terminal joint in ♂ short, obtuse, flattened and somewhat concave internally, in ♀ $\frac{2}{3}$, slender, acute. Maxillary palpi short, filiform, appressed to tongue. Posterior tibiæ clothed with long hairs above. Forewings with 2 from towards

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angle, 8 and 9 out of 7, 7 to termen, 11 from middle. Hindwings 1, elongate-ovate, cilia $\frac{4}{5}$; 3 and 4 connate, 5—7 tolerably parallel.

In palpi and general characters intermediate between *Periacma* and *Cryptolechia*, but differing from both in 9 of forewings rising out of 7.

Mesothyrsa œlopis, n. sp.

♂ ♀. 15-18 mm. Head and thorax pale ochreous-yellowish, sides of crown somewhat mixed with fuscous, shoulders suffused with dark fuscous. Palpi whitish-ochreous, in ♂ with apex of second joint and most of terminal except apex suffused with dark fuscous, in ♀ with a few dark fuscous scales. Antennæ pale yellowish. Abdomen whitish-yellowish, more or less sprinkled with grey. Forewings elongate, costa gently arched, apex round-pointed, termen sinuate, oblique; light ochreous-yellowish; markings purplish-grey mixed with blackish-grey, variable in development; a spot extending along basal fifth of costa; stigmata irregular, large or small, plical beneath first discal, sometimes cloudy grey fasciæ extending from both discal stigmata to dorsum, second also connected with a blackish spot on costa at $\frac{2}{3}$; a cloudy fascia along termen, sometimes connected with both extremities of the preceding fascia: cilia light ochreous-yellow, with grey spots above apex and on tornus. Hindwings whitish-ochreous, more or less suffused with light grey on margins; cilia whitish-ochreous.

Palni Hills, 6,000 feet (Campbell); four specimens. The single ♀ example shows less grey colouring than any of the ♂♂.

Cryptolechia, Zell.

The genera *Homosaces*, *Phaosaces*, and *Prosarotra* are structurally, but apparently not naturally, separable from *Cryptolechia*, and I have therefore included all together; the same differences of neuration and palpi occur also in *Periacma*.

Cryptolechia micracma, n. sp.

♂ ♀. 12-13 mm. Head and thorax ochreous-yellow. Palpi ochreous-yellowish, second joint rough-scaled above towards apex, apex dark fuscous, terminal joint in ♂ very short, in ♀ $\frac{1}{2}$. Antennæ pale yellowish ringed with fuscous. Abdomen whitish-yellowish, in ♀ dorsally suffused with grey. Forewings elongate, costa gently arched, apex tolerably pointed, more so in ♀, termen nearly straight, in ♂ rather strongly, in ♀ very oblique; 7 to apex; deep ochreous-yellow, irregularly sprinkled with dark fuscous; stigmata dark fuscous, plical nearly beneath first discal; a suffused dark fuscous spot on costa at $\frac{2}{3}$; an irregular terminal fascia of dark fuscous suffusion or irroration, projecting beneath so as to touch second discal stigma: cilia ochreous-yellow. Hindwings in ♂ pale yellowish, in ♀ light grey; cilia pale yellowish.

Ceylon (probably low country); Khasis; in July, three specimens.

Cryptolechia vespertina, n. sp.

♂ ♀. 17-20 mm. Head, palpi, antennæ $\frac{2}{3}$, and thorax dark fuscous, sides of crown pale ochreous. Abdomen pale ochreous, dorsally tinged with grey. Forewings elongate, costa gently arched, apex obtuse, termen almost straight,

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oblique ; 7 to apex ; dark purplish-fuscous, sprinkled with blackish ; stigmata large, cloudy, blackish, plical rather obliquely beyond first discal, second discal transverse ; sometimes a suffused whitish-ochreous spot on costa at $\frac{3}{4}$: cilia dark purplish-fuscous, with an interrupted whitish-ochreous basal line. Hindwings in ♂ whitish-ochreous more or less suffused with grey towards termen, in ♀ grey, paler towards base and suffused with whitish-ochreous along costa anteriorly ; cilia whitish-ochreous with grey subbasal shade.

Khasis ; in September, eight specimens.

Cryptolechia ararna, n. sp.

♂ ♀. 9-11 mm. Head dark fuscous, face pale ochreous, sides of crown mixed with yellow-ochreous. Palpi pale ochreous, externally dark fuscous except towards apex of second joint. Antennæ dark fuscous, beneath pale ochreous. Thorax and abdomen dark fuscous. Forewings elongate, rather dilated posteriorly, costa anteriorly slightly arched, posteriorly rather bent, apex obtuse, termen nearly straight, rather oblique ; 7 to termen ; dark purplish-fuscous, sprinkled with blackish ; some ochreous-yellow scales towards costa anteriorly ; a more or less developed rather broad undefined median fascia of ochreous-yellow irroration, broader towards costa ; some irregular scattered ochreous-yellow scales posteriorly : cilia dark fuscous, with more or less developed basal series of small ochreous-yellow spots. Hindwings and cilia dark fuscous.

Khasis ; from July to October, five specimens.

Cryptolechia arvalis, n. sp.

♂ ♀. 15-17 mm. Head and thorax pale ochreous-yellowish, longitudinally streaked with ferruginous suffusion. Palpi whitish-ochreous, sprinkled with ferruginous and dark fuscous, second joint with scales roughly expanded towards apex above, terminal joint with a blackish submedian ring. Antennæ pale yellowish, indistinctly dotted with fuscous. Abdomen grey, anal tuft pale yellowish. Forewings elongate, slightly dilated posteriorly, costa gently arched, apex tolerably pointed, termen slightly sinuate, oblique ; 7 to termen ; ferruginous more or less sprinkled with black, costa and all veins marked with suffused pale ochreous-yellowish streaks : cilia light ochreous-yellowish, on basal half and on tornus throughout barred with ferruginous suffusion sprinkled with black. Hindwings dark grey ; cilia light grey, becoming whitish-ochreous round apex.

Karwar (Maxwell) ; Coorg, 3,500 feet (Newcome) ; in July and December, seven specimens.

Cryptolechia iridias, n. sp.

♂ ♀. 17-21 mm. Head golden ochreous, face and sides of crown more or less suffused with dark purple-bronzy. Palpi ochreous-yellow, second joint more or less bronzy towards base. Antennæ light ochreous, towards base suffused with dark purplish-fuscous. Thorax yellow-ochreous, suffused anteriorly with dark purplish-fuscous. Abdomen light ochreous. Forewings elongate, slightly dilated posteriorly, costa gently arched, apex obtuse, termen

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nearly straight, rather oblique ; 7 to apex ; pale yellow-ochreous, more or less sprinkled with dark brownish, especially on apical third ; base of costa suffused with dark fuscous ; stigmata dark fuscous, plical rather obliquely beyond first discal : cilia pale yellow-ochreous. Hindwings pale shining ochreous, tinged with fuscous posteriorly ; cilia pale yellow-ochreous.

Khasis, in July and August ; four specimens.

Cryptolechia tyrochyta, n. sp.

♂. 19-20 mm. Head, antennæ and thorax light yellow-ochreous. Palpi ochreous-yellowish, second joint with scales roughly expanded above towards apex, irrorated or suffused with rather dark fuscous except towards apex. Abdomen grey, anal tuft ochreous-yellowish. Forewings elongate, moderate, costa gently arched, apex rounded-obtuse, termen rounded, somewhat oblique; 7 to apex ; light yellow-ochreous ; first discal stigma absent or represented by two or three blackish scales, second more or less well-marked, blackish ; in one specimen a few dark fuscous scales on tornus : cilia light yellow-ochreous. Hindwings grey ; cilia ochreous-yellowish.

Cuddapah, 4,000 feet (Campbell) ; three specimens.

Cryptolechia aganopis, Meyr.

♂. 15-19 mm., ♀ 19-26 mm. Forewing with 7 to apex (not termen as stated) ; varying from pale brownish-ochreous to light brown ; plical stigma in ♂ hardly beyond first discal, in ♀ obliquely beyond first discal, sometimes obsolete. Hindwings fuscous or pale fuscous.

Maskeliya, Madulsima, Kandy, Puttalam, Trincomali, Ceylon ; from May to February.

Cryptolechia orthotoma, Meyr.

♂. 14-17 mm., ♀ 15-21 mm. Forewings varying from pale-ochreous to light fuscous ; stigmata smaller in ♂.

Maskeliya, Peradeniya, Matale, Galle, Ceylon ; from February to August, and in November

Cryptolechia dochœa, n. sp.

♂ ♀. 14-20 mm. Head, antennæ and thorax whitish-ochreous, variably tinged with grey. Palpi ochreous-whitish, second joint with scales roughly expanded above towards apex, sprinkled with dark fuscous. Abdomen grey, anal tuft whitish-ochreous. Forewings elongate, costa gently arched, apex obtuse, termen obliquely rounded ; 7 to apex ; pale greyish-ochreous, sometimes tinged with brownish, more or less sprinkled with dark fuscous ; stigmata blackish, discal well-marked, plical obliquely beyond first discal, sometimes little marked ; a terminal series of small dark fuscous dots : cilia pale greyish-ochreous, with two more or less indicated fuscous lines. Hindwings light grey ; cilia pale greyish-ochreous, with one or two grey shades.

Maskeliya, Madulsima, Maturatta, Hakgala, Rambukkhana, Polgahawela, Patipola, Ceylon (Green, Alston, Vaughan) ; in May, June, and from September to February, seventeen specimens. Smaller than *aganopis*, and recognis-

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able by the different colouring and terminal dots. This is the species erroneously identified by me as *tetraspilella*, Walk., which latter is, I believe, really a *Xyloryctid*, and probably supersedes *Odites isocentra*, Meyr., though from the difficulty of properly examining the type I cannot positively identify it at present.

Cryptolechia temperata, n. sp.

♀. 20-24 mm. Head ochreous-yellow. Palpi pale ochreous-yellowish, smooth-scaled. Antennæ pale yellowish. Thorax ochreous-yellowish, more or less suffused with light brownish. Abdomen light ochreous-yellowish. Forewings elongate, slightly dilated posteriorly, costa gently arched, apex obtuse, termen nearly straight, rather oblique; 7 to apex, ochreous-yellow, towards dorsum, more or less tinged with brownish; stigmata brownish, first discal and plical minute, indistinct, plical obliquely beyond first discal, second discal larger and darker: cilia ochreous-yellow. Hindwings light grey, more or less tinged with pale ochreous; cilia pale ochreous-yellowish.

Simla; in July and August, four specimens.

Cryptolechia costæmaculella, Christ. (*Depressaria costæmaculella*, Christ. Bull. Mosc. 1882, 18, Snell. Tijd. v., Ent. xxvii, 158, pl. 8, 5.)

Sikkim; Darjeeling; in July. Described from Eastern Siberia; it is a species of distinct appearance, allied to the following, with which it entirely agrees in structure, having the palpi smooth-scaled, and vein 7 of forewings to apex; it is therefore no *Depressaria*.

Cryptolechia eoa, n. sp.

♀. 24 mm. Head and thorax ochreous-whitish, collar tinged with grey. Palpi ochreous-whitish, smooth-scaled, basal third and a subapical ring of second joint, and apical $\frac{3}{5}$ of terminal joint blackish. Antennæ greyish, mixed with blackish towards base. Abdomen pale ochreous, sprinkled with dark fuscous. Forewings sub-oblong, slightly dilated posteriorly, costa gently arched, apex obtuse, termen nearly straight, little oblique; 2 and 3 closely approximated at base; light greyish-ochreous, almost wholly suffused with light rose-pink except in middle of disc and a narrow more whitish-ochreous terminal fascia; some irregular scattered minute dots and strigulæ of blackish scales; a narrow blackish basal fascia; two or three blackish dots or marks on costa anteriorly; a small black costal spot at $\frac{3}{5}$; first discal stigma small, blackish; a moderate black fascia-form bar from costa beyond middle, extended so as to enclose in its apex second discal stigma, which is white, and with a triangular projection of grey suffusion mixed with black from middle of its posterior margin; two blackish spots on costa beyond this, united beneath costa; a series of blackish marks round apex and termen: cilia whitish-ochreous. Hindwings light greyish-ochreous, more greyish posteriorly; three or four grey marks on upper part of termen; cilia whitish-ochreous.

Khasis; in October, one specimen. This distinct species, though structurally in all respects a true *Cryptolechia*, not improbably indicates the origin of *Depressaria* from that genus.

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Depressaria, Haw.

The only species yet known to me from India are the two following, both from the Himalayan region ; the other species attributed to the genus by Stainton and others are not correctly referred.

Depressaria cyclas, n. sp.

♀. 19-20 mm. Head and thorax pale brownish-ochreous, patagia dark fuscous. Palpi whitish-ochreous, second joint irrorated with dark fuscous, terminal joint with dark fuscous median band. Antennæ pale ochreous infuscated above, especially towards base. Abdomen whitish-ochreous, irrorated with grey. Forewings elongate, costa gently arched, apex rounded, termen obliquely rounded ; 2 and 3 stalked ; pale brownish-ochreous, with irregularly scattered small dots and strigulæ of black scales ; an oblique black subdorsal dash at base ; costa irregularly spotted with blackish throughout, spots rather larger posteriorly ; discal stigmata round, black, an additional black dot obliquely before and above first discal ; an irregular dark fuscous blotch lying between and above discal stigmata, touching second but not first ; a spot of dark fuscous suffusion beneath costa at $\frac{3}{4}$; a terminal series of black dots : cilia whitish-ochreous, on basal half obscurely barred with greyish. Hindwings light grey, paler towards base ; three or four blackish-grey marks on upper part of termen ; cilia pale grey.

Dalhousie, Kashmir ; in May, two specimens. Most like the European *petasitis*.

Depressaria taciturna, n. sp.

♂♀. 24-25 mm. Head and thorax light brownish. Palpi brownish sprinkled with whitish, basal $\frac{3}{4}$ of second joint, and basal and supramedian bands of terminal joint dark fuscous, sometimes almost wholly suffused with dark fuscous except apex of terminal joint. Antennæ fuscous. Abdomen light greyish-ochreous more or less suffusedly irrorated with fuscous and dark fuscous. Forewings elongate, slightly dilated posteriorly, costa gently arched, apex rounded, termen obliquely rounded ; 2 rather widely remote ; brownish, sprinkled with darker, costal and terminal areas sprinkled with fuscous-whitish ; two indistinctly indicated oblique darker streaks from costa towards base, apex of second more or less marked with dark fuscous ; first discal stigma indicated by an oblique dark fuscous mark, sometimes followed by some fuscous-whitish scales, second by a fuscous-whitish dot, edged with some darker scales ; these are connected by an indistinct streak of darker suffusion, extending more or less beyond second ; a more or less developed sometimes interrupted similar streak along posterior half of submedian fold ; a somewhat darker curved subterminal line, on which the veins are indicated by scattered dark fuscous scales ; a series of cloudy dots of dark fuscous irroration round apex and termen : cilia light brownish sprinkled with darker, towards tips sprinkled with whitish. Hindwings pale fuscous, darker posteriorly ; cilia pale fuscous, with darker subbasal line.

Simla ; in August, three specimens. Perhaps nearest *veneficella*.

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Tonica, Walk.

This generic name supersedes *Binsitta*, Walk.

Tonica niviferana, Walk.

Peradeniya, Ceylon ; Karwar, Bombay, Calcutta, Sikkim. The pupa of this and the next species stands erect on its tail, and imitates the head of a small snake (Maxwell).

Tonica teratella, Walk.

(*Tonica terasella* (prav. form.), Walk., Cat. XXIX., 788.)

Karwar (Maxwell) ; Sikkim ; in July. Also from Borneo.

Tonica zizyphi, Staint.

(*Depressaria zizyphi*, Staint, Trans. Ent. Soc., Lond, (n.s.), V., 115 ; *D. angusta* Wals., Moore, Lep. Ceyl. III., 508, pl. 209, 5.)

Maskeliya, Kegalle, Puttalam, Ceylon ; Palni Hills ; in October. Stainton's type was from Calcutta ; it was bred from *Zizyphus jujuba*.

Protonostoma, n. g.

Head with appressed hairs ; ocelli present ; tongue developed. Antennæ $\frac{3}{4}$, in ♂ serrate, minutely ciliated, basal joint moderate, without pecten. Labial palpi very long, recurved, second joint with dense appressed scales, terminal joint shorter than second, moderate, acute. Maxillary palpi short, distinct, porrected. Posterior tibiæ shortly rough-scaled above. Forewings with 2 from angle, 7 and 8 stalked, 7 to termen, 11 from middle. Hindwings 1, ovate, cilia $\frac{1}{3}$; 3 and 4 connate, 5-7 parallel.

I consider this genus must approach very near the primitive form of the *Œcophoridæ*, from which the whole of the remainder could theoretically be derived. It has also marked affinity with the *Plutellidæ*, and indicates their probable origin from that family. The labial palpi, neuration, and superficial characters are of clear Œcophorid type. On the other hand the maxillary palpi are distinctly of Plutellid type, and I have not observed any similar in the *Oecophoridæ* ; the shortness of the cilia of hindwings, and apparent absence of long hairs on posterior tibiæ (these last are more or less damaged, and the structure is not quite clear) are also Plutellid characters. Superficially the species is very similar to *Hypercallia pyrarcha* described above. If the genus is regarded as primitive, then it might have given rise through *Cryptolechia* to the Depressariad subfamily, and through *Hypercallia* to the Oecophorid subfamily. This solution would apparently satisfy all conditions of the problem known to me at present.

Protonostoma æthopa, n. sp.

♂. 13-14 mm. Head ochreous-yellowish, crown dark fuscous except on sides. Labial palpi yellow, second joint mixed with orange and more or less irrorated with dark fuscous, terminal joint dark fuscous except apex. Maxillary palpi pale yellowish, apex black. Antennæ dark fuscous. Thorax dark fuscous with a yellow spot on each side posteriorly, patagia sometimes mixed with orange. Abdomen dark fuscous, beneath whitish-yellow. Forewings suboblong, moderately broad, costa moderately arched, apex obtuse, termen slightly round-

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ed, little oblique ; dark fuscous ; an irregular patch of yellow reticulated with ferruginous-orange in disc anteriorly ; oblique yellow marks edged with ferruginous-orange on costa at $\frac{1}{3}$ and $\frac{2}{3}$; a patch of suffused ferruginous-orange reticulation in disc beyond middle, touching second costal mark ; a submarginal series of more or less marked spots of ferruginous-orange suffusion running from second costal mark round apex and upper part of termen : cilia dark fuscous, with yellow patches above and below apex. Hindwings dark fuscous ; cilia dark fuscous, with more or less pale yellowish suffusion towards middle of termen.

Khasis ; in April and September, three specimens.

[*To be continued.*]

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ON THE BIRDS OF KOHAT AND THE KURRAM VALLEY, NORTHERN INDIA.

BY

LIEUT. C. H. T. WHITEHEAD, Indian Army.

With an Introduction by MAJOR H. A.F. MAGRATH, Indian Army.

I.—INTRODUCTION.

By Major H. A. F. MAGRATH.

Contrasted with a district of the Punjab, which I had just left, the variety of the surrounding bird-life was one of the first impressions received on my arrival at Kohat in December 1904, and it struck me that, as I was likely to be quartered there for some time, a list of the birds of the district might be usefully attempted. I had already made notes on a few of the commoner species, when I had the good fortune to discover in Mr. C. H. T. Whitehead, 56th Rifles, who had just rejoined his regiment at Kohat, a keen naturalist, anxious to start work at once on the ornithology of the district. We at once agreed to work together, and in spite of military duties which permitted of little leisure for the pursuit of hobbies, we had, by the end of February 1906, acquired at first hand a fair working knowledge of the local avifauna. In March 1906 my regiment moved to the Samana, a ridge 6,500 feet above sea-level and 30 miles due west of Kohat Station. This ridge forms the northern boundary of the Miranzai Valley, and overlooks on the north the Khanki Valley and Tirah, the land of the Afridis. Here a few interesting additions were made to our list—such as *Pica rustica*, *Accentor rufilatus*, *Accentor himalayanus*, *Fringillauda sordida*, and *Suya crinigera*. Meanwhile, Whitehead was doing good work below, and during the manœuvres secured, amongst other birds, an example of *Fringilla cœlebs*, a species new to India. In the end of April 1906 I proceeded home on furlough and, as the sequel will shew, the production of the List was then left entirely in Whitehead's hands. An interesting discovery made by him shortly after my departure was a nesting colony of *Aëdon familiaris* in the vicinity of the station. Taking two months' leave in June 1906, he paid a visit to the Kurram Valley lying to the N.-W. of Kohat, and followed to their breeding-grounds at the head of the valley many of the birds that winter in the plains around Kohat. During these two months he explored the Safed Koh Range very thoroughly, considering the short time at his disposal, ascending the two peaks of Sikaram (15,600 ft.) and Bodin (14,000 ft.), and by dint of real hard work, aided by much enthusiasm, added a great deal to our knowledge of the distribution and nesting-habits of many Oriental and Palæarctic species, discovering for the first time the nests and getting the eggs of *Saxicola capistrata* and *Phylloscopus subviridis*, besides obtaining some interesting mammals. His most important discovery, however, was a new

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race of *Anorthura* procured at 10,000 feet on the Safed Koh. To this bird he has very generously done me the honour of giving my name, an honour quite undeserved, which has made me insist on the trivial name of "Whitehead's Wren" for that species.

With the kind assistance of Dr. Bowdler Sharpe and Mr. Charles Chubb I was enabled to work out, at the British Museum, the skins procured by Whitehead on this trip, in addition to those previously collected in Kohat.

During my absence on leave my regiment had marched in course of relief to Bannu, the district which borders the Kohat District to the south. My official connexion with Kohat was, therefore, much to my regret (especially as I could no longer pursue my ornithological studies there) severed. Passing through Kohat Station on my return from leave, Whitehead met me with the interesting news that he had a few days previously shot a Waxwing (*Ampelis garrulus*), another new bird for India.

In April 1907, availing myself of three months' privilege leave and Whitehead at the same time obtaining a year's furlough, we decided to take a trip together to the Kurram Valley before he went home, in order to add, if possible, to the knowledge gained in the previous year. We met at Thall on the 15th of April and there awaited the sanction of the Political Agent of the Kurram Valley to our proposed expedition in the territory under his administration. The number of the smaller Passerine birds migrating up the valley at the time was very great, and we had plenty to interest us in this unusual leave-resort. The officer commanding the Post, Lieut. Wolley, with his wonted hospitality, invited us to consider ourselves honorary members of his little mess, which privilege we were only too glad to avail ourselves of. In due course the Political Officer's permit arrived, but it was so hampered by restrictions that we had to abandon our original intention of working slowly up the valley and proceed direct to Parachinar, the headquarters of the Agency, which is situated about 13 miles from the head of the valley. Here the officers of the Kurram Militia very kindly allowed us to make use of their exceedingly comfortable mess, and most hospitably entertained us during our stay. After obtaining permission to move up to Peiwar, 10 miles further up the valley, we left Parachinar on the 21st of April. The Political Agent was so solicitous for our safety that he insisted on our taking an armed tribal escort of six men with us. We did not require their military assistance, but found them useful to look for nests, climb trees, and carry our guns and lunch-baskets. Making the little rest-house at Peiwar our headquarters, we daily explored the surrounding Ilex jungle and visited several times the pine-clad hills on the Afghan border. In an Ilex, Whitehead was fortunate in coming across a nest, with eggs, of *Ægithaliscus leucogenys*. This bird is an early breeder, and six other nests that we found contained young. We had not been at Peiwar many days when rumours reached us from Parachinar that the Turis (the tribe inhabiting the Valley), who had been listening to wondrous tales of the spread of plague in Peshawar, poured into their ears by Kabuli

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traders and others passing up the valley from India to Afghanistan, had become highly suspicious of our movements and credited us with all sorts of nefarious deeds. We were supposed to be agents of the Government sent up to poison their-water-supply and to spread the plague. We were said to stalk abroad at night catching and inoculating rats, in order to disseminate the pestilence. Colour was lent to this ingenuous theory by the fact that we had trapped a few Mole-rats, Gerbilles, and Dormice. Curiously enough we could see no signs of hostility in the villagers themselves, in fact we found them invariably friendly, and our tribal escort seemed to know nothing of these rumours. We were now anxious to shift camp and to move up the slopes of Sikaram, as the snow, under the influence of the summer sun, was gradually receding. But, in face of the rumours related above, the Political Agent did not think it advisable for us to do so, and even considered that our presence at Peiwar might lead to some act of violence towards us, and be the cause of administrative complications in the valley. We were, therefore, asked to return to Parachinar, where a meeting was called of the leading Maliks, on the result of which our fate with respect to being allowed to continue collecting would depend. Unfortunately and much to our chagrin the verdict of the "Jirga" was against us, and the Political Agent called on us and informed us that, owing to the popular excitement, it would be quite unsafe for us to go in to camp and that we could only work in the immediate vicinity of Parachinar. Our expedition thus came to an untimely end, and, as there was nothing more to be done in the bird-line at Parachinar, we returned to Thall, whence a few days later Whitehead took his departure for England, and I to places where ignorance and superstition would cease from troubling.

I may mention that soon after we arrived in Parachinar from Peiwar news was brought in by a native officer of the local militia, who had been on leave to his village, that we had left Peiwar just in time. Had we remained another night, we were, like the Babes in the Wood, to have been foully murdered. All arrangements had been made, assassins hired, and our pleasant little camp was to have been converted into a shamble! This was a most amusing yarn which tickled us immensely! Gladly would we have accepted these small risks if only we had been allowed to continue our expedition.

A glance at the accompanying map* will give a good idea of the geography of this portion of the N.-W. Frontier of India. Situated between the 32nd and 35th parallels of latitude and the 69th and the 72nd meridians of longitude it is in shape somewhat like a pipe, the District of Kohat forming the bowl and the Kurram Valley the stem and mouthpiece. Its northern boundary proceeding from east to west, consists of the bare and rocky hills lying between it and the Peshawar District, the Samana Range (barren hills, inhabited by independent Orakzai and Afridi tribes) and the Safed-Koh Range. This rugged barrier of hills is on the east as low as 3,000 feet above sea-level,

* This Map (Plate III) has not been reproduced.—Eds.

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but gradually increases in height westward till it culminates in the imposing snowclad ramparts of the Safed-Koh Range, the highest peak of which, Sikaram (15,600 feet), lies at its western extremity. To the west it is bounded by Afghanistan and Waziristan, to the south by the districts of Bannu and Mianwali, and to the east by the R. Indus.

The general aspect of Kohat is a confused mass of low bare rocky hills, nullahs, and ravines, intersected by two main depressions running parallel and with a general trend from west to east. These depressions are formed, in the first case, by the Miranzai and Kohat Valleys running in prolongation of each other, and in the second by the Teri Valley. Two alluvial plains are also noticeable, namely, that around and east of Kohat Station, and the oasis of Lachi. The Kurram is a long valley, averaging some 2 miles in width at its lower end and broadening into a stoney plain 8 or 10 miles wide at its upper extremity and rising in the 70 miles from Thall 4,000 feet. Down its centre rushes, over a bed of stones and boulders, the river that gives its name to the valley, which rises in Afghanistan some 20 miles beyond the valley-head. Consisting, as the district does, for the most part of desert, the flora, compared with that of the Himalayas, is not luxurious. Coarse grass, Olives, thorn-scrub, and Dwarf Palms sparsely cover the hills, and in parts of the Miranzai Valley and around Thall the two latter form thick scrub-jungle. Ilex-Oaks, where their branches are not ruthlessly lopped and the trees are permitted to grow attain a considerable size on the Samana, and here and there on this hill some fine Ash-trees flourish. In the Safed-Koh Range, however, forests of Fir, Pine, and Cedar clothe the mountain-sides from about 8,000 to 12,000 feet, and cover the top of the spur over which the Peiwar Pass runs. Below, these forests are gradually replaced by Ilex trees which again, as one descends to the low foot-hills, are replaced by dense Ilex-scrub.

Where water is easily brought on to the land, as is the case in the plains around Kohat and Lachi and in the Kurram, Hangu, and Teri Valleys, green oases of cultivation relieve the general barrenness. A feature of the cultivation around Kohat and in the Miranzai Valley consists of the beautiful orchards of Mulberry, Peach, Plum, Fig, and Vine which abound, and are supplemented, in the stonier parts, by groves of wild Olive-trees. The crops consist mainly of wheat; but Indian corn, barley, millet, cotton, and sugarcane are also grown, and around Bangu, Thall, and in the Kurram Valley, rice. Immediately south of the station of Kohat the Government grass-farm, possesses many attractions for birds on migration, and, after irrigation, is not a bad place to observe Waders: even Duck and Snipe have been shot on it. The climate is very dry. As regards temperature: in the plains of Kohat the winter might be compared to that of the south of France, but the summer is decidedly hotter and probably most nearly approximates to that of Egypt. In the Kurram Valley temperatures are much lower, and the climate of Upper Kurram must be somewhat similar, both in summer and in winter, to that of Northern Germany.

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Ornithologically speaking, this corner of the Palæarctic Region* has hitherto been little worked. With the exception of the two papers by Colonel R. H. Rattray published in the "Journal" of the Bombay Natural History Society, "Notes on Nests taken from March to June at Kohat and Mussoorie, North-Western Provinces" (vol. x. p. 628), and "Birds collected and Observed at Thall" (vol. xii. p. 337), and a few observations by Major Wardlaw-Ramsay and others mentioned in the "Fauna of British India," I know of no contribution to its ornithology†. Neither Hume nor Jerdon, Oates nor Blanford, nor others of India's many excellent ornithologists, appear to have visited it. And yet it is an important locality, lying as it does in the extreme north-west of the Peninsula on one of the great migration-highways into India, and at a point on that highway where it converges to its narrowest limits. The pre-eminently Palæarctic character of the avifauna is most striking. Especially is this noticeable in the forms breeding in the Upper Kurram, very few of the many subtropical species inhabiting the Western Himalayas being found there. From the description of the Country and from its geographical position the predominance of such groups as the Accipitrines, Motacillidæ, Fringillinæ, Emberizinæ, and of the desert-forms will not be considered surprising. Although undoubtedly well represented on migration, the Ducks, Waders, and shore-birds are difficult of observation in Kohat. With the exception of the grass-farm, the tank at Dhand-Idl-Khel, and some marshy tracts round Thall and Lachi, this district is singularly devoid of the moist places beloved of Wildfowl and Waders, no streams of any size flowing through it. Matters improve in this respect on arriving at the Kurram Valley. The river here being taken off for rice-cultivation in places along its banks, marshy spots have formed, and in the month of February, March and April, September and October, numbers of Wild-fowl and Waders, using

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* Dresser in the preface to his "Manual of Palæarctic Birds" does not clearly define the Palæarctic boundary in this locality, and by omitting all reference to the plains of India would seem to imply that Kohat belongs to the Indian Subregion. On the other hand, Blanford in his "Distribution of Vertebrate Animals in India" assigns the plains of the Punjab to the Palæarctic Region. Professor Newton, however, in his article on "Birds" in the 'Encyclopædia Britannica,' remarks that if Baluchistan is to be excluded from the Palæarctic Region, "then the line of demarcation must run inland and so continue between that land and Afghanistan *till* ascending the right bank of the Indus it turns the shoulder of the Great Snowy range." The italics are mine, and I take this to mean that the line of demarcation strikes the Indus at a point in prolongation eastward of the Boundary-line between Afghanistan and Baluchistan, *i.e.*, somewhere in the vicinity of Dera Ghazi Khan. If this is the correct interpretation of Newton's views then the ornithology of N. W. India strongly supports them.

† There is only one allusion to Kohat itself in the "Fauna of British India," and that is in connection with the occurrence there of the Red-wing (*Turdus iliacus*), recorded by Jerdon on hearsay from Blyth, on hearsay from Trotter. After more than two years' careful observation we failed to come across this bird, and I think we may safely say that it is not "a regular winter visitant," if it occurs at all.

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this river-route on migration, are induced to halt on their way, affording good sport to "Sahibs" and Turi villagers. The importance of this river as a migration-route is illustrated lower down, where it debouches into the sandy plains of Bannu, outside of the area which we are now considering. Here vast quantities of Wild fowl, Waders, and Gulls, on migration to their far-off northern homes from the lower reaches of the Indus and the Manchar Lake in Sind, are to be observed, in the months of February and March, asleep or preening their feathers on the mudbanks in mid-river. The majority of these birds undoubtedly keep to the river-route, there being no other important water-way lying near their line of migration, and must therefore, of necessity, pass up the Kurram Valley. It may be wondered at that the River Indus, bordering Kohat, has not been mentioned as suited to the observation of Water-fowl. But in this portion of its course that great river is confined between hills, and flows over a rocky bed, consequently here it affords no feeding grounds or resting-places for such birds. Whitehead came down it in a boat at a time of year when he might have expected to find birds, but his journey proved disappointing. On the whole, then, Kohat and Kurram must be looked on as a profitable locality to the Indian ornithologist.

The straggling of Western Palæarctic forms, not as yet recorded within Indian limits, into this area is probably of commoner occurrence than might be supposed, and, were it possible for a winter to be spent in collecting in the Upper Kurram, yet new species to the Indian list would doubtless be forthcoming. The task we set ourselves in our late trip, so unfortunately interrupted, still remains to be done, and most assuredly new breeding species to India await the discoverer.

It was at first intended to publish two separate papers, one on the birds of Kohat and another on those of the Kurram Valley, but Mr. Whitehead has decided, wisely as I think, to combine them. The two localities are contiguous, and the latter is, as I mentioned before, the breeding-ground of many species that winter in the plains. Of the total number of 340 species which the list contains, 321 were found in Kohat, the remaining 19 were met with only in the Kurram Valley. Considered together, therefore, the single paper will be found to be of greater scientific value than if the two districts had been separately treated, and Mr. Whitehead deserves much credit for the excellent piece of work which he has accomplished.

II.—Preface.

By C. H. T. Whitehead.

Major Magrath does not take any credit for his own work. Before I even started he had made a fair list of the birds of Kohat, and it was his enthusiasm that infected me. All that I have done is to somewhat amplify this list and add a little to the notes. The paper should have been written by him, but he insisted on my doing so, and has now most kindly gone carefully through it, making many necessary corrections and alterations and entirely

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rewriting the account of the Bulbuls of the genus *Molpastes*, the hybrid forms of which he was the first to observe in Kohat.

Much interesting information was kindly contributed by Mr. D. Donald, C.I.E., the Political Officer and Commandant of the Border Military Police and Samana Rifles, which his long residence in Kohat (some 18 years), his frequent tours in the district, the interest he takes in birds generally, and in the Accipitrines in particular, and his great reputation as a falconer, render of especial value.

Specimens of most of the Passerine and of a large number of the remaining birds included in this paper were shot and carefully compared with Oates and Blanford's excellent descriptions, measurements and points of difference if any, being always recorded, but only in the case of their not corresponding or of their being of special interest were skins made, for time did not permit of more. These skins are now in the British Museum and are those referred to in the paper. Amongst them will be found melanistic varieties of several species (*Lanius lahtora*, *Passer domesticus*, *Anthus similis*, *A. spipoletta*), which, except in the case of the Shrike, were shot out of flocks of similarly coloured birds. Taken as a whole, however, the birds of the District are characterized by their pale colouring, which is what one would expect from the desert nature of the country.

Many more birds appear to halt in Kohat in the spring migration, which continues from February till well into June, than in the autumn. This is probably due to the configuration of the locality. The main Kohat Valley at its junction with the Indus is comparatively broad but narrows considerably towards the Kurram River, with which it is connected by the Ishkalai, an insignificant stream flowing in at Thall. The latter stream is probably easily missed by the hosts of migrants passing down the Kurram River in autumn. Major Magrath writes that they migrate down this river in the Bannu District in great numbers in August, September, and the first half of October.

In square brackets are added notes on those species met with by Major Magrath in Bannu, but not found by us in Kohat or in the Kurram Valley, as most of them are likely to occur within our limits. The Bannu District, however, exhibits a great contrast to Kohat, consisting as it does for the most part of a broad, well-watered, highly cultivated plain with a good deal of marsh-land.

In the following notes, wherever the expression "we" is used it refers, of course, to Major Magrath and myself, as we worked together.

The word "plains" is used, as it usually is in India, to denote the low country—*i.e.*, in this case, below about 3,000 feet—as opposed to the main hill-ranges, and not merely the flat country, the greater part of Kohat being a maze of low hills and ravines. Similarly the word "desert" is used in its wider sense to include stony and not necessarily level wastes which cover such a large part of the District (there is very little sandy desert).

The nomenclature followed is that adopted by Oates and Blanford in the

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'Fauna of British India, Birds,' and the numbers placed in brackets before the scientific names are those used in that work.

The following is a list of the papers chiefly referred to, all contributed to the 'Journal of the Bombay Natural History Society':—

RATTRAY, Colonel R. H.—Birds Collected and Observed at Thall. xii. pp. 337 to 348 (1899).

MARSHALL, Capt. T. E.—Notes on the Birds near Quetta: Part I. xiv. pp. 601 to 602 (1902); Part II. xv. pp. 44 to 64 (1903).

FULTON, Capt. H. T., D.S.O.—Notes on the Birds of Chitral. xvi. pp. 44 to 64 and p. 744 (1904).

RATTRAY, Colonel R. H.—Birds' nesting in the Murree Hills and Galis. xvi. pp. 421 to 428 and pp. 657 to 663 (1905).

CUMMING, J. W. N.—Birds of Seistan. xvi. pp. 686 to 699 (1905).

WARD, Colonel A. E.—Birds of the Provinces of Kashmir and Jammu and Adjacent Districts. xvii. pp. 108 to 113, pp. 479 to 485 (1906), pp. 726 to 729, pp. 943 to 949 (1907); xviii. pp. 461 to 464 (1908).

To obviate the inconvenience of looking up these papers I have added references, and where possible the gist of the note. Attention is also drawn to Capt. PERREAUS. "Notes on the Bird of Chitral" xix (4) pp. 901-922 February 1910. It supplements Capt: FULTON's paper.

My best thanks are due to Dr. Bowdler Sharpe and Mr. Charles Chubb for much assistance in the identification of my skins, and to the former for very kindly going through my notes and putting them into correct form in spite of a great press of other work. Also to Dr. Hartert for going through the series of Wagtail and Pipit-skins. Lastly, to Dr. Sclater, F.R.S., for most kindly looking through the proofs and seeing the paper through the press.

III.—LIST OF BIRDS AND REMARKS.

By Lieut. C. H. T. WHITEHEAD.

[1.] CORVUS CORAX. The Raven.

Rattray, J. B. N. H. S. xii. p. 337 (common round Thall); Marshall, op. cit. xiv. p. 681 (the small race very common and resident at Quetta); Cumming, op. cit. xvi. p. 686 (rare in Seistan); Ward, op. cit. xvii. p. 108.

Ravens of all sizes are very common in the cold weather, especially round human habitations, the majority leaving in April or early in May, but I have counted over 80 roosting together as late as the 18th of May near Kohat.

A few, however, mostly smaller birds, are resident all the year round.

[3.] CORVUS CORONE. The Carrion-Crow.

Cumming, J. B. N. H. S. xvi. p. 686 (common in winter in Seistan, and often seen about houses); Ward, op. cit. xvii. p. 108 (resident in Kashmir, nesting between 8,000 and 10,000 ft.).

505. ♂ ad. Kurram Valley, 5,800 ft., 19th April.

I am not sure whether this species occurs in the plains or not. Major Magrath has found it fairly common in winter in Bannu, so it probably does.

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In the Upper Kurram Valley it nests freely in April from 5,000 ft. upwards, a Chinar (Plane-tree) near a village being usually selected as a nesting site. Like the Raven, the Carrion-Crow is not a dweller in the wilds in these parts, but prefers the neighbourhood of mankind.

[4.] CORVUS MACRORHYNCHUS. The Jungle-Crow.

Rattray, J. B. N. H. S. xii. p. 337 (Thall : very common) ; Fulton, op. cit. xvi. p. 45 (Lower Chitral : very common) ; Rattray, t. c. p. 421 (very common up to 9,000 ft. : Murree Hills); Ward, op. cit. xvii. p. 108.

Abundant in the plains from November till mid-April (last seen on the 28th), partially taking the place of *C. splendens*. In summer it retires to the Ilex-and Fir-clad slopes of the higher ranges, nesting freely on the Safed Koh.

[5.] CORVUS FRUGILEGUS. The Rook.

Marshall, J. B. N. H. S. xiv. p. 601 (once seen in January near Quetta) ; Cumming, op. cit. xvi. p. 686 (common in Seistan in winter) ; Ward, op. cit. xvii. p. 108 (occurs in winter along the R. Jhelum).

641. ♂ juv. Samana, 6,500 ft., 5th March.

744, 745. ♀ ; 746 ♂ juv. Kohat, 1,760 ft., 25th March.

Visits the district in large flocks in winter, arriving in November and remaining as late as the middle of April. The birds, however, staying on through March appear to be almost all young which have not entirely shed the face-feathers and nasal bristles. Oates, in the 'Fauna of India,' writes: "About January or when the young bird is about nine months old the nasal bristles are cast, and by March the front part of the head has become entirely denuded of feathers." Here, neither are entirely lost till April. The above-mentioned examples represent the ordinary type found here in March.

[6.] CORVUS SHARPII. Sharpe's Hooded Crow.

Corvus sharpii, Oates, F. B. I., Birds, i. p. 20 ; Cumming, J. B. N. H. S xvi. p. 686 (common in Tamarisk-jungle of Seistan) ; Ward, op. cit. xvii. p. 109 (a rare visitor to Kashmir).

We have not observed the Hoodie in Kohat, but Mr. Donald, the Political Officer, tells me that he has met with one or two almost every year, generally about the grass-farm. This Crow is a common winter visitor to the Peshawar and Bannu Districts, which are better suited to its habits. From the latter Major Magrath has sent a typical specimen of the race *Corvus cornix sharpii* to the British Museum.

[7.] CORVUS SPLENDENS. The House-Crow.

Rattray, J. B. N. H. S. xii. p. 337 (not common at Thall) ; Ward, op. cit. xvii. p. 109 (common in the low country).

A resident and extremely common in summer. In mild winters numbers remain, but in severe weather it almost entirely disappears, *C. macrorhynchus* taking its place as the common cook-house scavenger.

[9.] CORVUS MONEDULA. The Jackdaw.

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Rattray, J. B. N. H. S. xii. p. 387 (rare in Thall); Ward, op. cit. xvii. p. 109.

A rather rare winter visitor from December till March, occurring with large flocks of Rooks. Major Magrath noted immense flocks coming into the station on five consecutive evenings, just before the cold wave in January 1905. Similar flocks, but mixed with Rooks, roosted in cantonments for a few nights in February 1908.

[10.] PICA RUSTICA. The Magpie.

Marshall, J. B. N. H. S. xiv. p. 601 (common round Quetta); Fulton, op. cit. xvi. p. 46 (very common in Upper Chitral); Cumming, t. c. p. 686 (scarce in Seistan: 1,700 ft.); Ward, op. cit. xvii. p. 109 (common in Ladak and Baltistan).

661. Marai, 2,900 ft., 9th March.

773. ♀ ad. Raisan, 2,100 ft. 1st April.

A resident, but somewhat rare in Kohat, being more often seen in Samilzai than elsewhere; a few pairs also occur on the Samana, where Major Magrath found a nest in April built in an Ilex, just above the tennis-court. In the Upper Kurram Valley it is very common, especially near Peiwar, and occurs up to the tree-limit. The nest is usually placed in an Ilex, and is of the normal type, though often within six or seven feet of the ground. The above examples appear to be typical *P. rustica*.

[16.] DENDROCITTA RUFA. The Indian Tree-Pie.

Rattray, J. B. N. H. S. xii. p. 337 (Thall: a few seen); Ward. op. cit. xvii. p. 109.

670. ♂ ad. Raisan, 2,300 ft., 12th March.

709. ♂ ad. Kohat, 1,760 ft., 19th March.

A common winter visitor to Kohat, arriving early in September and leaving about mid-April. A few pairs, however remain to nest, Mr. Donald, the Political Officer, having several times observed young birds in July in the Miranzai Valley barely able to fly.

[4.] GARRULUS LANCEOLATUS. The Black-throated Jay.

Rattray, J. B. N. H. S. xii. p. 337 (Thall: common on the hills); Fulton, op. cit. xvi. p. 46 (Lower Chitral: very common from 5,000 to 10,000 ft.); Rattray, t. c. p. 421 (very common round Murree); Ward, op. cit. xvii. p. 109.

Rare in the plains. During the cold spell in November and December, 1905, a few individuals occurred about the grass-farms and the orchards of Kohat. A resident on the Samana Range above 5,000 ft., but not common.

Fairly plentiful in the Ilex scrub in the Kurram Valley, occurring up to 8,000 ft. Generally goes about in parties of four or five, out of the breeding-season, but sometimes collects into big flocks. Major Magrath observed one of about forty individuals near Peiwar (7,000 ft.) in April 1907. Very shy and difficult to observe.

[-8.] NUCIFRAGA MULTIPUNCTATA. The Larger-spotted Nutcracker.

Fulton, J. B. N. H. S. xvi. p. 46 (only got one specimen, no others seen);

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Ward, op. cit. xvii. p. 109, xviii. p. 451 (common: young hatch out in April; probably two broods).

Occurs sparingly amongst the conifers of the Safed Koh, but is more often heard than seen. Its cry resembles the syllables "*kăck-kăck*" rapidly repeated, hence its Pushtu name "Khăkārra."

[30.] PYRRHOCORAX ALPINUS. The Yellow-billed Chough.

Marshall, J. B. N. H. S. xiv. p. 605 (occurs at 10,000 ft., near Quetta); Fulton, op. cit. xvi. p. 46 (Chitral: very common from 5,000 ft. to 16,000 ft., according to season); Ward, op. cit. xvii. p. 109 (occurs from 5,500 ft. in winter upwards, often caught in traps set round carrion for foxes).

Not common, but fairly well distributed in summer along the upper slopes of the Safed Koh above tree-limit. By the end of June the birds had collected into small flocks.

[31.] PARUS ATRICEPS. The Indian Grey Tit.

Marshall, J. B. N. H. S. xiv. p. 601 (winter visitor to Quetta: seen at Ziarat, 8,000 ft., in May); Fulton, op. cit. xvi. p. 46 (Chitral: very common); Rattray, t. c. p. 421 (very common up to 6,500 ft.: Murree); Ward, op. cit. xvii. p. 109.

327. ♂ juv. Safed Koh, 7,500 ft., 16th July.

A very common winter visitor to the District from mid September till about the third week in April. A resident on the Samana above 5,000 ft. Nests in the Ilex-scrub of the Upper Kurram in fair numbers.

ANTHOSCOPUS CORONATUS. The Turkestan Penduline Tit.

Hartert, Pal. Vogel, i. p. 392.

Lachi, 1,500 ft., 25th March; ♂ ♀ ad., Kohat, 1,760 ft., 7th—8th April; ♂ ad., Kohat, 1,760 ft., 18th March.

Major Magrath first observed a party of these Tits on a Peach-tree in his garden in April 1905. Since then we have met with the bird regularly from mid-March till mid April in parties of from two or three to forty or more, chiefly frequenting Shisham trees, but also orchards and Camel-thorn scrub. The call-note resembles that of *Zosterops palpebrosa* and is constantly uttered.

Mr. T. R. Bell, I.F.S., was the first to discover this species in India. He met with parties of it in February 1904 in the tamarisk-acacia scrub-jungle near Sukkur, Sind, and procured several examples (*vide* J. B. N. H. S. xvii. p. 244).

[37.] ÆGITHALISCUS LEUCOGENYS. The White-cheeked Tit.

Fulton, J. B. N. H. S. xvi. p. 46 (resident and very common from 6,000 to 12,000 ft. in Lower Chitral); Ward, op. cit. xvii. p. 109.

333. ♂ ad. Safed Koh, 1,800 ft., 20th July.

391. ♀ ad. Samana, 5,000 ft., 5th November.

A resident in the Upper Kurram Valley and on the Samana, being largely reinforced on the latter in winter: and at that season some descend to the lower scrub covered hills occurring as far south as the Mianwali District, and down to 2,500 ft., where I have met with parties as late as the 9th of April.

Breeds freely in the Ilex-scrub near Peiwar from 6,000 to 8,000 ft. Nesting operations must commence towards the end of March, as a nest found on the

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1st of May contained fully fledged young. The nest is usually placed near the top of an Ilex-bush from three to seven feet above the ground. It is egg-shaped and rather like that of the British Long-tailed Tit, but a good deal smaller and not quite so neat. It is made of moss and cobwebs outside, lined with a little grass, with a thick inner lining of feathers. The opening is usually near the top, but is sometimes nearer the centre. We came across seven nests altogether, the first six containing young, and the seventh a nearly fresh clutch of five eggs, these are pure white, three having a very faint zone of spots round the large end, the remainder being unmarked, and averaging ·58″ × ·39″. The clutch appears to vary from five to eight. The young closely resemble their parents, but the colours are duller, and the black of the chin and throat is replaced by a few indistinct dusky streaks.

Capt. Keen also observed a pair of these Tits with a newly fledged family on the Samana.

In habits this species closely resembles the Long-tailed Tit, going about in parties of eight or nine in scrub-jungle continually uttering its call-note, which may be rendered by the syllables "prit-t-t," and often in company with *Parus atriceps*.

[44.] LOPHOPHANES MELANOLOPHUS. The Crested Black Tit.

Fulton, J. B. N. H. S. xvi. p. 46 (abundant in Chitral from 5,000 to 12,000 ft.); Rattray, t. c. p. 422 (common in the Murree Hills); Ward, op. cit. xvii. p. 110 (common in Kashmir).

Very common on the Safed Koh from 6,500 ft. to tree-limit. An early breeder. Major Magrath found a nest containing young on the 25th of April. It has a great variety of notes.

[91.] TROCHALOPTERUM SIMILE. The Western Variegated Laughing-Thrush.

Fulton, J. B. N. H. S. xvi. p. 47 (resident and very common up to 6,000 ft. in Lower Chitral); Rattray, t. c. p. 422 (very common round Murree, up to 10,000 ft.); Ward, op. cit. xvii. p. 422.

417. Ad. Samana, 5,600 ft., 19th December.

A resident, but rare. Altogether I met with about a dozen individuals in one wooded nullah on the northern slope of the Samana, but nowhere else. It is a great skulker; its loud whistling notes, however, proclaim its presence. Usually found creeping about the densest part of the undergrowth.

[99.] TROCHALOPTERUM LINEATUM. The Himalayan Streaked Laughing-Thrush.

Rattray, J. B. N. H. S. xii. p. 337 (common in winter: Thall); Marshall, op. cit. xiv. p. 602 (common at 4,000 ft. in February: Quetta); Fulton, op. cit. xvi. p. 47 (abundant in Chitral); Rattray, t. c. p. 422 (commonest bird in Murree Hills); Ward, op. cit. xvii. p. 110.

130. ♂ ad. Marai, 3,000 ft., 25th February.
579. Sex ? Kohat, 1,760 ft., 13th February.
633. ♀ ad. „ „ 1st March.
653. ♀ ad. Hangu, 2,700 ft., 8th March.

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Abundant and resident on the Samana, many birds wintering in the Miranzai and Samilzai Valleys, and, in the winter of 1907/1908, and again in 1909 quite a number visited the orchards around Kohat, staying till April. Occurs also in the Kurram Valley up to 7,000 ft., but not so commonly.

[105.] ARGYA CAUDATA. The Common Babbler.

Rattray, J. B. N. H. S. xii. p. 337 (abundant at Thall); Cumming, op. cit. xvi. p. 686 (very common in Seistan); Ward, op. cit. xvii. p. 110 (found in the outer ranges).

A resident and very common, especially in scrub-jungle, only occasionally, visiting gardens. Does not ascend the hills to any height, its place being taken by *Crateropus canorus*.

Breeds in April and May.

[104.] ARGYA EARLII. The Striated Babbler.

Major Magrath obtained an example of this species last March in a reed-bed in Bannu.

[110.] CRATEROPUS CANORUS. The Jungle Babbler.

Ward, op. cit. xvii. p. 110 (chiefly confined to Jammu).

639. ♂ ad. Hangu, 2,700 ft., 3rd March.

666. ♂ ad. Marai, 3,000 ft., 10th March.

A resident, taking the place of *Argya caudata* from the foot of the hills where the two occur together, up to 4,000 feet in winter and 6,000 feet in summer. Fairly common, too, in the Miranzai Valley in winter, wherever there is plenty of scrub-jungle. Not observed in the Kurram Valley.

[139.] PYCTORHIS SINENSIS. The Yellow-eyed Babbler.

Major Magrath has met with parties of this Babbler in the sugar-cane fields and reed-beds of Bannu. An example shot by him is now in the National Collection.

[187.] MYIOPHONEUS TEMMINCKI. The Himalayan Whistling-Thrush.

Rattray, J. B. N. H. S. xii. p. 338 (common in winter: Thall); Marshall, op. cit. xiv. p. 602 (Quetta: 7,000 ft. in May); Fulton, op. cit. xvi. p. 47 (common in Lower Chitral); Rattray, t. c. p. 422 (common in Murree Hills); Ward, op. cit. xvii. p. 110.

A fairly common winter visitor from mid-September till mid-April, rather rare round Kohat, but common in the Miranzai and Samilzai Valleys on the Samana and occurring as far south as the Mianwali District. A resident in the Kurram Valley, nesting between 6,000 and 8,000 feet. Usually found about cliffs and groves near water, but sometimes in very dry shadeless spots some distance from water.

[191.] LARVIVORA BRUNNEA. The Indian Blue-Chat.

Rattray, J. B. N. H. S. xvi. p. 423 (common at Murree); Ward, op. cit. xvii. p. 110 (nests in Kashmir up to 8,000 ft.).

Occurs in summer along the lower slopes of the Safed Koh between 6,500 and 8,000 ft., but is not common except in one or two secluded glens. Very shy, has a rich but quite short song.

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[226.] ZOSTEROPS PALPEBROSA. The Indian White-eye.

774. ♂ ad. Kachai. 2,700 ft., 1st April.

A cold weather visitor to the District, the first parties arriving in August, but it does not become common till October, it leaves toward the middle of April. Possibly a resident on the Samana: a party of eight or nine stayed there during the winter of 1906-07, in spite of frequent heavy snow-storms; a large number arrived early in April, though whether only on migration or not I cannot say, as I left shortly afterwards. Not observed in the Kurram Valley.

[269.] HYPSIPETES PSAROIDES. The Himalayan Black Bulbul.

Fulton, J. B N. H. S. xvi. p 47 (common in summer); Rattray, t. c. p. 424 (common round Murree); Ward, op. cit. xvii. p. 111 (common in Kashmir).

583. ♀ ad. Kohat, 1,760 ft., 15th February.

630. ♂ ad. „ „ 1st March.

In 1907 several parties of this species visited the district early in February, staying till the end of March. They were always to be found about the same spot never wandering far away. Berries of the Boquain tree (*Persian lilac*) seemed to form their staple food.

[283.] MOLPASTES INTERMEDIUS.* The Punjab Red-vented Bulbul

Ward, J. B. N. H. S. xvii. p. 111 (found in Pooneh and Jammu).

634. ♀ ad. Kohat, 1,700 ft., 1st March.

733. ♂ ad. „ „ 23rd March.

786. ♂ ad. „ „ 4th April.

A resident and not uncommon in the gardens and orchards around Kohat, though seldom seen elsewhere in the District. This species, as Major Magrath has pointed out, probably interbreeds with *M. leucogenys*, as they are so often seen together, and birds intermediate in colouring are so common (*vide* next note). Mr. Donald, the Political Officer, states that on two separate occasions he has met with the present species in Kohat paired with a yellow vented Bulbul and *at the same nest*. Further, that it is well known amongst local gardeners that the red and yellow-vented Bulbuls do interbreed, their progeny being known as "Neemchi," *i.e.*, half-breeds. *M. intermedius* is the common resident Bulbul of the Peshawar district north of Kohat.

List of hybrids between *M. intermedius* and *M. leucogenys*.

				Ear-coverts.	Under tail-coverts.
590. ♂ ad.	Kohat, 1,760 ft.,	16th Feb.		dingy white.	yellow.
564. Ad.	„ „	6th „		„	orange.
631. ♀ ad.	„ „	1st Mar.		dark brown.	red.
635. ♀ ad.	„ „	2nd „		„	pale buff.
689. ♀ ad.	„ „	16th „		dirty white.	yellow with orange tips.
700. ♂ ad.	„ „	17th „		white.	orange.

* For Dr. R. Bowdler Sharpe's opinion on the series of Bulbul (*Molpastes intermedius*, *leucogenys*, *leucotis* and *magrathi*) we collected, see the "Ibis," April 1909, p. 302.

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710. ♀ ad.	Kohat, 1,760 ft.,	19th Feb.	dark brown.	dull crimson.
735. ♀ ad.	„ „	24th „	„	„
758. ♂ ?	„ „	28th „	dusky white.	orange.
785. ♀ ad.	„ „	4th Apr.	dull white.	lemon-yellow.
790. ♂ ad.	„ „	5th „	„	brownish-orange.
791 ♂ ad.	„ „	5th „	„	orange-yellow.

(A truly wonderful series, but the birds *must* be hybrids.—*R.B.S.*)

These remarks are by Dr. Sharpe, and from them it will be seen that the series ranges from an almost pure *M. intermedius* to a nearly pure *M. leucogenys*. No two examples are alike, some being more like "*intermedius*," others more like "*leucogenys*" or "*leucotis*."

[284.] MOLPASTES LEUCOGENYS. The White-cheeked Bulbul.

Fulton, J. B. N. H. S. xvi. p. 47 (Chitral: summer visitor from March to October; very common up to 7,000 feet); Ward, op. cit. xvii. p. 111 (very common in Kashmir).

591. ♂ ad.	Kohat, 1,760 ft.,	16th Feb.	Very grey on the breast, but with pale yellow under tail coverts.
724. ♂ ad.	„ „	21st Mar.	„ „ „
767. ♀ ad.	„ „	31st „	More typical.
779. ♂ ad.	„ „	2nd Apr.	„ „
780. Ad.	„ „	„	„ „
789. ♀ ad.	„ „	5th Apr.	„ „
792. ♂ ad.	„ „	„	„ „

[I do not call these birds true *P. leucogenys*, as they are so much darker on the head, which is nearly blackish, and have not the olive on the back. They illustrate how variable is the coloration of this species in Kohat. In spite of its abundance it is difficult to procure an example true to type. Most of the birds seen have the breast mottled, *i.e.*, instead of having the black of the upper breast clearly defined from the light colour of the lower parts, it graduates into it, frequently combined with a mottled back and sullied cheek-patches and a blackish head with or without a supercilium, R. B. S.]

Major Magrath, who has specially studied the Bulbuls in Bannu, kindly contributes the following note on the present species:—

"Dr. Bowdler Sharpe is, I believe, inclined to the view that this Bulbul differs generically from *Molpastes*. With this I can hardly agree. Seen in its natural state, the bird is a true *Molpastes*. In habits and notes it differs little from the next species, with which it mixes freely, and from which it is anything but easy to distinguish when in a tree. It seems likely that the two species interbreed, but I have had no opportunity of observing a fertile cross, although I have seen wild birds which looked very like hybrids between the two species. The diet of the present species is perhaps more insectivorous than that of the next. It is much addicted to the habit of fly-catching in the evenings and is often seen on the ground, feeding on ants and grubs under trees. It is less of a garden bird than the next species. Its staple food in

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these parts is the berries of the Ber (*Zizyphus vulgaris*) and Boquain (*Melia azedarach*) trees. Numbers of this species are caught in Bannu in winter and hawked about the bazaars, perched on pieces of stick, to which they are attached by a long string tied round the body. Although I have examined several of these captives and bought many in order to release them, in no case have I seen among them a bird of the next species, which is also so common at Bannu. I attribute the ease with which the present species is caught to its greater fearlessness and to its partiality for the grubs of the white ant, with which the traps are usually baited: this attraction the birds are simply unable to resist."

This Bulbul is resident in Kohat, and breeds freely in the Station and in the orchards round about.

[285.] MOLPASTES LEUCOTIS. The White eared Bulbul.

Rattray, J. B. N. H. S. xii. p. 338 (common in February and March, a few pairs staying to breed); Marshall, op. cit. xiv. p. 602 (a few occur in March and April); Cumming, op. cit. xvi. p. 686 (Seistan: saw several which appeared to be of this species, but failed to secure any).

In July 1905 Major Magrath found a pair of Bulbuls nesting in his garden which he took to be of the present species. At that time he concluded that this bird in summer replaced the last as the breeding species in Kohat and was unaware, as we subsequently discovered (*vide* note on the last species), that *M. leucogenys* bred commonly in and around Kohat Unfortunately we did not critically study the Bulbuls at that time, and not having since spent a "hot-weather" in Kohat we have not had an opportunity of collecting any examples of the present species. According to Major Magrath, the note of this bird is well represented by the following words repeated rapidly: "Quick—a drink with you?"

MOLPASTES MAGRATHI. Magrath's Bulbul.

Whitehead, Bull. B. O. C. xxi. p. 48 (1908).

In February 1907 Major Magrath sent a skin of a Bulbul obtained in the Bannu District to Dr. Bowdler Sharpe. The latter and other eminent ornithologists who examined it, finding that there was nothing exactly like it in the National Collection, were of opinion that it belonged to a new species. This opinion was further strengthened by the arrival of three more specimens collected by Major Magrath in the same locality. These all agreed more or less with the first example sent, except that the black of the breast in one was clearly defined from the whitish lower parts, instead of graduating into them as in the other specimens. At a meeting of the British Ornithologists' Club held on the 15th of January, 1908, I exhibited these specimens and described the bird as a new species, naming it as above in honour of its discoverer.

Major Magrath's specimens differ from the hybrid forms already described in being closely allied to *M. leucotis* and not to *M. leucogenys*. It is difficult to ascribe them to a hybrid form, as in the case of the Kohat birds, because

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M. intermedius does not, Major Magrath assures me, occur in Bannu, and *M. leucogenys* there is always more or less true to type. Dr. Sharpe also concurs in this].

[320.] SITTA KASHMIRENSIS. Brooks's Nuthatch.

Fulton, J. B. N. H. S. xvi. p. 48 (Chitral : very common from 6,000 to 11,000 ft. ; Ward, op. cit. xvii. p. 111 (obtained in April in Kashmir).

Fairly common on the Peiwar Spur of the Safed Koh and in the adjoining nullahs from 7,500 to 10,000 ft.

[323.] SITTA LEUCOPSIS. The White-cheeked Nuthatch.

Fulton, J. B. N. H. S. xvi. p. 48 (Chitral : very common from 7,000 to 12,000 ft.) ; Rattray, t. c. p. 424 (fairly common above 8,000 ft. : Murree Hill) ; Ward, op. cit. xvii. p. 111 (fairly common).

This is the common Nuthatch of the Safed Koh, from 8,000 ft. to tree-limit. Its curious call-note, resembling the word " pain " (pronounced like the French word for " bread "), may be heard all day long.

[327.] DICRURUS ATER. The Black Drongo, or King Crow.

Rattray, J. B. N. H. S. xii. p. 338 (summer visitor to Thall ; Fulton, op. cit. xvi. p. 48 (Chitral : common in summer up to 5,500 ft.) ; Ward op. cit. xvii. p. III (Kashmir : occurs up to 7,000 ft.).

One of our commonest summer visitors from the plains up to 8,500 feet in the Kurram Valley, the first birds arriving in the middle of March and the species becoming common a fortnight later. It disappears towards the end of October. Probably, however, the Drongo we observed above 7,000 feet on the Safed Koh belonged to the allied species *D. longicaudatus*, the differences not being very marked and the latter being a common bird in the Murree Hills. Unfortunately no examples were procured.

[341.] CERTHIA HIMALAYANA. The Himalayan Tree-Creeper.

Fulton, J. B. N. H. S. xvi. p. 48 (shot in August) ; Rattray, t. c. p. 424 (Murree Hills : very common) ; Ward, op. cit. xvii. p. 111 (abundant up to 10,000 ft.).

623. ♀ ad. Kohat, 1,760 ft., 29th February.

690. ♀ ad. ,, ,, 16th March.

A common cold-weather visitor to the District from September till April, occurring on the Samana up to 6,000 feet. It does not by any means restrict itself to trees : I have often noticed it climbing up walls.

Breeds in fair numbers on the Safed Koh, from 7,000 to 9,000 feet.

The call-note is a faint squeak, rarely heard in winter. In summer its loud but rather monotonous song is constantly uttered.

[348.] TICHODROMA MURARIA. The Wall-Creeper.

Marshall, J. B. N. H. S. xiv. p. 602 (Quetta : occurs in winter from 1,000 feet upwards) ; Fulton, op. cit. xvi. p. 48 (Chitral : common from October till April) ; Ward, op. cit. xvii. p. 111 (winter visitor, sometimes assuming black throat-feathers.)

40. Ad. ? Khushalgarh, 1,200 ft., 16th December.

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315. ♂ juv. Safed Koh, 15,000 ft., 12th July.

A winter visitor to the District from October till mid-March ; common on the Samana, but less so elsewhere. Generally found singly or in pairs about cliffs, but occasionally some distance from rocks on earth-banks.

An example shot on the 13th of March had the black feathers on the throat and breast well developed.

On the 12th of July, 1906, I came across a newly-fledged family at 15,000 feet on the Safed Koh, in the shale screes, and shot one specimen. The wing-and tail-feathers were only partially grown, the bill was quite soft and very short, and bits of down were still adhering to its plumage. It would therefore appear that the Wall-Creeper nests within Indian limits. When touring through the Kaghan Valley, Hazara District, this year (10th of July, 1908) my shikari minutely described to me a bird that he had seen that day, which could scarcely be anything else but a Wall-Creeper.

Mr. S. L. Whymper also informed me in a letter (I have not got this by me, but, so far as I remember, it was to the following effect) that a friend of his had actually found a Wall-Creeper nesting somewhere on the North-West Frontier, but had been unable to get at the nest.

ANORTHURA MAGRATHI. Whitehead's Wren.

Whitehead, Bull. B. O. C. xxi. p. 19 (1908).

343. ♂. Safed Koh, 12,500 ft., 6th August.

344. ? Safed Koh, 8,500 ft., 8th August.

Bill blackish, base and gape yellow ; torsus brownish flesh-coloured ; iris brown.

This appears to be a well-marked race of *A. neglecta*, differing from it in being almost uniform in colouring above, the barring being scarcely perceptible, and in having the throat ashy grey. In summer it is found fairly commonly on the Safed Koh, from 8,000 feet upwards, chiefly in the juniper-scrub. I have met with it on the very summit of the range, picking about amongst the rocks.

In habits and song it closely resembles *A. parvula* and *A. neglecta*.

[358.] REGULUS CRISTATUS. The Goldcrest.

Ward, J. B. N. H. S. xvii. p. 111, and xviii. p. 461 (not common ; eggs taken in May, June, and July in the Liddar Valley, Kashmir).

Fairly numerous in summer amongst the firs and deodars of the Safed Koh from 8,000 to 11,000 feet.

[359.] AEDON FAMILIARIS. The Grey-backed Warbler.

Rattray, J. B. N. H. S. xii. pp. 225, 339 and 579 (fairly common at Thall ; found several nests) ; Watson, op. cit. xv. p. 144 (occurs at Chaman, near Quetta, in August and September) ; Cumming, op. cit. xvi. p. 686 (very common in Seistan in summer).

246. ♀ ad. Kohat, 1,760 ft., 6th May.

Fairly common up to 3,500 feet, from April till September, in dry scrub-jungle : round Thall it is particularly common. In the breeding-season the

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male may often be seen perched on the top of a bush, pouring forth its sweet song. In many of its habits it resembles the Indian Robin (*Thamnobia cambayensis*), especially in the way it flirts and spreads its tail, and also in its tame and confiding habits. If the intruder happens to approach the nest, the pair will follow him about uttering their alarm-cry—*wutch, wutch.* If the nest be found they get terribly excited, and will sometimes remain hovering in the air within a few feet. Of five nests found, three were placed in thorn-bushes close to the ground, the other two on the ground under low shrubs. They were cup-shaped and loosely constructed of coarse grass and roots. I looked in vain for the bit of serpent-skin which Mr. Dresser, in the 'Manual of Palæarctic Birds,' states is always found in the nest of this species.

The specific title (*familiaris*) is very appropriate, but the trivial name (Grey-backed) seems to be only misleading, for the back is fulvous-brown, the most noticeable feature being the bright red, white-tipped tail which the bird is so fond of displaying.

[362.] LOCUSTELLA STRAMINEA. The Turkestan Grasshopper-Warbler.

742. ♀ ad. Kohat, 1,760 ft., 25th March.
749. Sex ? „ „ 26th March.
776. ♂ ad. „ „ 2nd April.

Passes through the District in fair numbers from the third week in March till the middle of May. Not observed in autumn. It is chiefly found on the grass-farms and in young crops, occasionally in gardens. It is not such a skulker as one would expect ; there is no difficulty in flushing it, but it is not easy to observe or to shoot, except on the wing.

[363.] ACROCEPHALUS STENTOREUS. The Indian Great Reed-Warbler.

Ward J. B. N. H. S. xvii. p. 112 (breeds in Kashmir in June).

Common on migration from the end of March till well into June, and again in August and September ; possibly a few stay to nest in Kohat.

I found a small colony nesting in a reed-bed near Dandar, (4,700 ft.), in the Kurram Valley, on the 9th of July.

[366.] ACROCEPHALUS DUMETORUM. Blyth's Reed-Warbler.

Ward, J. B. N. H. S. xvii. p. 112 (summer visitor to the Valley of Kashmir).

203. ♀ ad. Kohat, 1,760 ft., 13th April.
231. ♂ ad. „ „ 29th April.
247. ♂ ad. „ „ 6th May.
360. Juv. „ „ 30th August.

Like the last species, this Warbler passes through in great force in April, May, and early June, returning in August and September. Not often found in reed-beds, preferring shady gardens and orchards. The sweet rambling song may often be heard issuing from the midst of a thick mulberry-tree. Probably breeds in the Upper Kurram Valley.

The upper plumage of this species is distinctly tinged with olivaceous. Mr. Oates does not mention this in the 'Fauna of British India.'

[367.] ACROCEPHALUS AGRICOLA. The Paddyfield Reed-Warbler.

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Ward, J. B. N. H. S. xvii. p. 112 (nest not found).

729. ♂ ad. Kohat, 1,760 ft., 23rd March.

Our commonest Reed-Warbler on migration, passing through from the third week in March till about the end of May and returning in August, September, and October. Seldom found far away from reed-beds or irrigated crops.

Occurs with the last species on migration in the Kurram Valley, and perhaps breeds there. Both Davidson ('The Ibis,' 1898, p. 9) and Lieut. Wilson (J. B. N. H. S. xii. p. 635) found it nesting in Kashmir.

[374.] ORTHOTOMUS SUTORIUS. The Indian Tailor-bird.

Ward, J. B. N. H. S. xvii. p. 112 (occurs in Jammu, but is rare).

751. ♀ Kohat, 1,700 ft., 27th March.

A resident, common in gardens and orchards around Kohat. Not observed in the Kurram Valley.

[377.] LUSCINIOLA MELANOPOGON. The Moustached Sedge-Warbler.

152. ♂ ad. Kohat, 1,850 ft., 19th March.

696. ♀ ad. Lachi, 1,540 ft., 17th March.

A winter visitor in small numbers, largely reinforced in February and March. I have searched for it in May in the plains without success, but, on the other hand, I shot an example at Dandar (4,700 ft.) in the Kurram Valley on the 20th of April and saw others but found none there in July. The wing and wing-muscles, however, are so feeble that it can scarcely go very far away to breed. Has a pleasing song which is often uttered, even in winter.

[381.] CISTICOLA CURSITANS. The Rufous Fantail-Warbler.

77. ♀ ad. Kohat, 1,760 ft., 11th January.

Abundant in summer wherever there is cultivation. The majority leave in autumn, but a few stay through the winter, and are then more often found in and around reed-beds than elsewhere. In the Kurram Valley we observed it as high as Parachinar (5,700 ft.)

[384.] FRANKLINIA BUCHANANI. The Rufous-fronted Wren-Warbler.

121. ♂ ad. Jabba, 2,400 ft., 18th February.

781. ♂ ad. Kohat, 1,760 ft., 3rd April.

A common resident in the scrub-jungle of the District, but does not ascend the hills, usually occurring in small parties or pairs. It is always on the move, either creeping about in bushes or running mouse-like along the ground from one bush to another. In spring the air resounds with its cheery little song.

[394.] HYPOLAIS RAMA. Sykes's Tree-Warbler.

Marshall, J. B. N. H. S. xiv. p. 602 (summer visitor, nesting in May : Quetta) ; Bentham, op. cit xvi. p. 749 (nests freely in rose-hedges : Quetta).

546. ♂ ad. Thall, 2,500 ft., 11th May.

759. ♂ ad. Kohat, 1,760 ft., 29th March.

Occurs sparingly on migration.

[396] HYPOLAIS CALIGATA. The Booted Tree-Warbler.

Ward, J. B. N. H. S. xvii. p. 112 (passes through Baltistan, but rare)

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229. ♂ ad. Kohat, 1,760 ft., 29th April, 1906.

551. ♀ ad. Thall, 2,500 ft., 15th May 1907.

Passes through in fair number in April and May, returning in August. Usually found in dry scrub. In appearance very like *Phylloscopus tristis*, but not quite so active. This species probably breeds within our limits.

[Major Magrath procured an example of the rare *Hypolais obsoleta* at Bannu on the 8th September 1907. It was creeping about in grass with others.]

[398.] SYLVIA CINEREA. The Common Whitethroat.

Ward, J. B. N. H. S. xvii. p. 112.

357. ♀ ad. Kohat, 1,760 ft., 30th August.

358. ♂ ad. ,, ,, ,,

Not common. Only a few observed during the autumn migration at the end of August and beginning of September 1906.

[399.] SYLVIA JERDONI. The Eastern Orphean Warbler.

Marshall, J. B. N. H. S. xiv. p. 602 (common in April and May: Quetta); Cumming, op. cit. xvi. p. 687 (common in the Tamarisks: Seistan); Betham, t. c. p. 831 (nests freely in April and May above 7,000 ft.: Quetta); Ward, op. cit. xvii. p. 112 (recorded at Gilgit on migration).

491. ♀. ad. Thall, 2,500 ft., 14th April.

A summer visitor, and not common. Has a very fine song. We found several pairs in the scrub round Thall in April. On picking up the above-example, I noticed some cobwebs in the bill, and on looking round found a nest in a thick bush close by. It was composed of roots, bits of green plants, and a lot of cobwebs, and had not been completed.

[400.] SYLVIA NANA. The Desert-Warbler.

Watson, J. B. N. H. S. xv. p. 145 (occurs near Chaman).

452. Sex ? ad. Lachi, 1,500 ft., 24th February.

This example was shot creeping about in a thorn-bush in the desert. Only one other was seen, and that was in a similar spot, the following year.

[401.] SYLVIA ALTHÆA. Hume's Lesser Whitethroat.

Marshall, J. B. N. H. S. xiv. p. 602 (believes that this sp. is fairly common at 8,000 ft. in May); Fulton, op. cit xvi. p. 48 (shot three in May between 5,000 and 7,000 ft.); Ward, op. cit. xvii. p. 112, and xviii. p. 461 (eggs taken in May and July at 8,000 ft.)

232. ♀ ad. Kohat, 1,760 ft., 29th April.

Passes through Kohat and the Kurram Valley in spring and autumn, but is not common. In spring I have generally observed it in Shisham trees (*Dalbergia sissoo*) in company with the next species. These trees are then in flower and attract much insect-life. Birds shot in them generally have their heads covered with pollen. A beautiful songster.

[402.] SYLVIA AFFINIS. The Indian Lesser Whitethroat.

Rattray, J. B. N. H. S. xii. p. 338 (winter visitor, not common: Thall); Betham, op. cit. xvi. p. 831 (a few pairs nest round Quetta); Ward, op. cit. xvii. p. 112 (common in summer in Kashmir).

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41. Sex? Khushalgarh. 1,200 ft., 16th December.

101. ♀. Kohat, 1,760 ft., 5th February.

Passes through in large numbers in spring and autumn, a few staying for winter. Breeds freely in the Kurram Valley in Ilex-scrub and low bushes from 6,000 to 8,000 feet. Like the last species it has a pleasing and remarkably loud song, often uttering it on the wing. Much more confiding in summer than at other seasons.

[403.] SYLVIA MINUSCULA. The Small Whitethroat.

Marshall, J. B. N. H. S. xiv. p. 602 (small flocks on migration in April).

521. ♀ ad. Peiwar, 6,500 ft., 22nd April.

Probably not uncommon, but owing to its close resemblance to the last species must have often been overlooked. Altogether I shot some half dozen specimens around Kohat in the cold weather. It appears to breed, in company with the last species, in the Kurram Valley, this example having been secured in a locality where many of the latter were then nesting.

[407.] PHYLLOSCOPUS TRISTIS. The Brown Willow-Warbler.

Marshall, J. B. N. H. S. xiv. p. 602 (shot one in February); Ward, op. cit. xvii. p. 112 (eggs taken in Ladakh).

56. ♂ ad. Kohat, 1760 ft., 21st December.

110. ♂ ad. „ „ 11th February.

Extremely common up to about 5,000 feet from early September till about the middle of May. Found everywhere, in gardens, groves, scrub-jungle and desert; also on stony hill-sides where there is vegetation, in bare stubbles, and standing crops. It frequents more especially the neighbourhood of water, reed-beds, water-plains, and irrigation cuts. An expert flycatcher and very active. Except in spring, it is very silent.

[408.] PHYLLOSCOPUS INDICUS. The Olivaceous Willow-Warbler.

Ward, J. B. N. H. S. xvii. p. 112 (eggs taken in August in Ladakh, 11,500 ft.).

185. ♂ ad. Kohat, 1,760 ft., 5th April.

Passes through Kohat in small numbers on migration in March and April. I only once observed it on the return migration, *viz.*, a solitary example on the 16th of September. Nests freely in parts of the Safed Koh Range. Differs in habits from other Willow-Warblers in being rather a skulker, as it is usually found hopping and creeping unthatch-like about in the undergrowth. Its loud call-note of "Tack" often indicates its whereabouts.

[411.] PHYLLOSCOPUS NEGLECTUS. The Plain Brown Willow-Warbler.

Ward, J. B. N. H. S. xviii. p. 461 (eggs taken and parents secured at Kargil in May and June).

706. ♀ ad. Kohat, 1,760 ft., 18th March.

This species is so difficult to distinguish from *P. tristis* until actually examined in the hand, that it is impossible to say whether it is fairly common or merely a straggler. The above-mentioned example was the only one secured. It was busily fly-catching in a willow just like *P. tristis*.

[415.] PHYLLOSCOPUS PROREGULUS. Pallas's Willow-Warbler.

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Rattray, J. B. N. H. S. xvi. p. 424 (nests freely in the Galis); Ward, op. cit. xvii. p. 112 (common in Kashmir).

664. ♀ ad. Marai, 3,000 ft., 9th March.

667. ♀ ad. Kachai, 2,700 ft., 10th March.

Not common. I have met with it in spring at the foot of the hills and in summer on the Safed Koh at 8,500 feet. Its song is very characteristic. Call note "*tchit*".

[416.] PHYLLOSCOPUS SUBVIRIDIS. Brooks's Willow-Warbler.

102. ♂ ad. Kohat, 1,760 ft., 5th February.

113. ♀ ad. „ „ 10th February.

276. Sex? Samona, 6,500 ft., 12th April.

319. ♀ ad. Safed Koh, 8,800 ft., 13th July.

Fairly common in the District from October to April. Generally found solitary or in pairs in scrub and wild olive-groves, more rarely in orchards and gardens. Occurs on the Samana in large numbers on migration. Nests freely on the lower slopes of the Safed Koh from 7,000 to 9,000 ft. A nest found on the 13th of July, 1906, evidently an old one re-lined, was placed in the bank of a nullah under cover of a small bush. It was of the usual Willow-Warbler type and contained four fresh eggs (this was the full clutch, the female having no eggs in the oviduct). They were white, thickly spotted with dark red, and averaged ·55 × ·4 inch.

In summer this Warbler frequently utters a loud monosyllabic call-note, not unlike that of the next species but not so loud. In winter this is only occasionally heard.

[418.] PHYLLOSCOPUS HUMII. Hume's Willow-Warbler.

Fulton, J. B. N. H. S. xvi. p. 48 (only two obtained in Chitral); Rattray, t. c. p. 424 (very common in the Murree Hills); Ward, op. cit. xvii. p. 113 (breeds in Kashmir).

48. Ad. Kohat, 1,760 ft., 23rd December.

55. ♂ ad. „ „ 31st December.

119 & 120. ♂ ad. Kohat, 1,760 ft., 16th February.

153. Ad. Kohat, 1,760 ft., 18th March.

Abundant in the cold weather in Kohat from September till the end of April, frequenting gardens, orchards and groves—usually singly. It has a loud call-note resembling the syllable "*pchwey*," which is constantly uttered. Occurs on the Samana on migration, and nests in large numbers on the Safed Koh from 7,000 to 11,000 feet. Its curious song, which may be rendered "*pi-pi-piaz-z*" (this being repeated with variations), is first heard in March, whilst still in its winter-quarters, and is continued throughout the summer being usually uttered from the midst of a thick tree.

[421.] ACANTHOPNEUSTE NITIDUS. The Green Willow-Warbler.

Ward, J. B. N. H. S. xvii. p. 113.

766. Ad. Kohat, 1,760 ft., 31st March.

784. ♂ ad. „ „ 2nd April.

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Passes through Kohat and the Kurram Valley in large numbers from the last week in March till the end of May, returning in September, when comparatively few are seen. This is the last Willow-Warbler to leave, and I have met with it at Kohat up till the 28th of May. Major Magrath says that this species is extremely common in Bannu in September and October. Its relative scarcity at that season in Kohat, together with that of many other species, may perhaps be accounted for by its following the Kurram River down through the Bannu District instead of turning off at Thall up the Ishkalai, an insignificant stream which connects the Miranzai and Kurram Valleys.

[424.] ACANTHOPNEUSTE MAGNIROSTRIS. The Large-billed Willow-Warbler.

Rattray, J. B. N. H. S. xvi. p. 425 (fairly common in the Galis); Ward, op. cit. xvii. p. 113 (apparently rare).

I have only met with this species on the lower slopes of the Safed Koh, where its nests in small numbers between 7,000 and 8,000 feet. The call-note is loud and characteristic, resembling the syllables "*dirtee*." Song monotonous and poor.

[428.] ACANTHOPNEUSTE OCCIPITALIS. The Large-crowned Willow-Warbler.

Rattray, J. B. N. H. S. xvi. p. 425 (very common round Murree); Ward, op. cit. xvii. p. 113 (nests from 7,000 to 8,000 ft. in Kashmir).

535. ♂ ad. Kurram Valley, 6,800 ft., 28th April.

Occurs sparingly in the Kohat orchards in April and May, but not observed in autumn. Abundant, however, on the Safed Koh Range in summer from 6,000 to 10,000 feet, being quiet the commonest Willow-Warbler there. Its loud monotonous song may be heard from dawn to dusk all the summer through.

[434.] CRYPTOLOPHA XANTHOSCHISTA. Hodgson's Grey-headed Flycatcher-Warbler.

Rattray, J. B. N. H. S. xvi. p. 426 (rare in Murree Hills, one nest found) Ward, op. cit. xvii. p. 113.

624. ♀ ad. Kohat, 1,760 ft., 29th February.

629. ♂ ad. (testes big). Kohat, 1,850 ft., 1st March.

665. ♂ ad. Marai, 3,000 ft., 9th March.

A fairly common winter-visitor to the district, arriving about the third week in October and leaving early in April. This species and *Suya crinigera* are the only Warblers found on the Samana above 5,000 feet all through the winter; it is difficult to understand how they manage to pick up a living, the hill-side being often covered with snow for days together. Frequents scrub-jungle, gardens, and orchards, going about in small parties and often uttering its pretty little song even in mid-winter.

[445.] SCOTOCERCA INQUIETA. The Streaked Scrub-Warbler.

Rattray, J. B. N. H. S. xii. p. 338 (Thall: common); Watson, op. cit. xv p. 145 (very common round Chaman, near Quetta).

436. ♀ ad. Banda 1,900 ft., 27th January.

608. ♂ (testes very big.) Lachi, 1,540 ft., 25th February.

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A common resident among scrub on dry stony hill-sides, but not seen above 3,500 feet, nor far from the foot of the hills. The specific name is very appropriate: it is never still, but is always flitting or running mouse-like about from bush to bush, only pausing occasionally to sing a few notes of its cheery little song.

[456.] CETTIA ORIENTALIS. The Eastern Bush-Warbler.

167. ♂ ad. Lachi, 1,540 ft., 27th March.

701. ♂ ad. Kohat, 1,760 ft., 17th March.

732. ♂ ad. „ „ 23rd March.

734. ♀ ad. Chillibagh, 2,100 ft., 24th March.

Bill dark brown, lower mandible flesh-coloured, gape yellowish; tarsus flesh-coloured; iris brown.

Passes through Kohat in fair numbers in March, frequenting reed-beds, gardens, and generally thick cover near water. A great skulker, usually occurring singly. My attention was first drawn to this species by a loud note, resembling the syllable "*chey*," proceeding from the midst of a tamarisk. After much peering, I made out a small brown bird vigorously flirting its tail and evidently much resenting my presence. It was in this way that I always met with it.

[458.] SUYA CRINIGERA. The Brown Hill-Warbler.

Rattray, J. B. N. H. S. xvi. p. 426 (nests freely in Murree Hills); Ward, op. cit. xvii. p. 113 (common in Kashmir).

663. ♀ ad. Marai, 4,000 ft., 9th March.

677. ♂ ad. Thall, 2,500 ft., 14th March.

A resident on the Samana and fairly common. In winter it descends to the Miranzai Valley, occurring commonly in the scrub jungle near the foot of the hills, also in the low hills of S. Kohat.

We did not meet with it in the Kurram Valley, though I shot one at the entrance near Thall.

[462.] PRINIA LEPIDA. The Streaked Wren-Warbler.

Cumming, J. B. N. H. S. xvi. p. 687 (fairly common amongst the Tamarisks: Seistan, 1,700 ft.); Ward, op. cit. xvii. p. 114 (occurs in outer hills, but not in Kashmir proper).

617. ♂ (testes very big). Lachi, 1,540 ft., 26th February.

697. ♀ ad. Lachi, 1,540 ft., 17th March.

698. ♂ ad. „ „ „

A resident in the plains, and not uncommon about reed-beds and tamarisk-scrub, being particularly abundant in the Lachi Plain. Nesting operations are begun in March, and from then till May its curious reeling song is constantly to be heard.

[463.] PRINIA FLAVIVENTRIS.

Major Magrath has found this species common in the reed-beds of Bannu, the adjoining District on the south, and has forwarded examples to the British Museum.

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[466.] PRINIA INORNATA. The Indian Wren-Warbler.

Rattray, J. B. N. H. S. xii. p. 337 (Thall: occurs in the reeds); Ward, op. cit xvii. p. 113.

683. Ad. Thall, 2,500 ft., 14th March.

750. ♂ ad. Kohat, 1,600 ft., 26th March.

Resident but rather rare, except along the banks of the Kurram River.

In Bannu, however, where the country is more suited to its habits, Major Magrath has found it extremely common.

[469.] LANIUS LAHTORA. The Indian Grey Shrike.

Rattray, J. B. N. H. S. xii. p. 338 (Thall: an uncommon summer visitor); Marshall, op. cit. xiv. p. 602 (in April near Quetta); Ward; op. cit. xvii. p. 479 (occurs in Jammu).

567. ♂ ad. Kohat 1,760 ft., 6th February.

658. ♀ ad. Hangu, 2,650 ft., 8th March.

A resident, chiefly found in the desert, but not commonly, more numerous in winter than summer. Major Magrath found a nest containing four slightly incubated eggs on the 12th of May near Thall. Not met with above 3,500 feet in the Kurram Valley.

[473.] LANIUS VITTATUS. The Bay-backed Shrike.

Rattray, J. B. N. H. S xii. p. 338 (very common and resident at Thall); Marshall, op. cit. xiv. p. 602 (Quetta; an uncommon summer visitor); Fulton, op. cit. xvi. p. 48 (Chitral: common in summer up to 6,000 ft).

520. ♂ ad. Kurram Valley, 6,500 ft., 23rd April.

Fairly common from the last week in March (single birds noted on 1st and 2nd March) till September in Kohat and the Kurram Valley. I noted it in Lahore, some 200 miles S.-E., early in February.

[476]. LANIUS ERYTHRONOTUS. The Rufous-backed Shrike.

Rattray J. B. N. H. S. xii. p. 338 (Thall; abundant); Marshall, op. cit. xvi., p. 602 (Quetta: very common in summer); Fulton op. cit. xvi. p. 43 (common in Chitral in summer up to 7,000 ft.); Betham, t. c. p. 750 (breeds freely); Ward, op. cit. xvii. p. 479 (widely distributed in Kashmir).

A resident, and extremely common in summer everywhere up to 7,000 feet. The majority leave for warmer climes in autumn.

[479.] LANIUS ISABELLINUS. The Pale-brown Shrike.

Marshall, J. B. N. H. S. xiv. pp. 602, 606 (Quetta: a summer visitor, nesting in May between 7,000 and 9,000 feet.

109. ♀ ad. Kohat, 1,700 ft., 8th February.

A fairly common winter visitor from October to April.

I shot an example in the Kurram Valley at 6,500 feet on the 2nd of May; possibly a few pairs nest up there.

[480.] LANIUS PHOENICUREIDES. The Rufous Shrike.

[867.] RAISAN, 2,400 ft., 5th March.

A scarce winter visitor.

[495.] PERICROCOTUS BREVIROSTRIS. The Short-billed Minivet.

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Fulton, J. B. N. H. S. xvi. p. 49 (Chitral : summer visitor, nesting commonly from 7,000 to 9,000 ft.) ; Rattray, t. c. p. 426 (Nests freely in Murree Hills) ; Ward, op. cit. xvii. p. 479 (breeds in Kashmir).

A common winter visitor to the District from the end of September to April. Nests freely on the Safed Koh between 6,000 and 8,000 feet. Captain Keen observed a few on the Samana all through the summer, and believes that they nested there. An example collected by Major Magrath in Bannu and now in the National Collection, is typical.

[500.] PERICROCOTUS PEREGRINUS. The small Minivet.

Ward, J. B. N. H. S. xvii. p. 479.

Very rare. I came across a pair in some camel-thorn scrub (*Acacia modesta*) three miles west of Makhud on the Indus, but unfortunately failed to secure one. It is a bird I know well, however, having frequently met with it near Rawal Pindi (100 miles east).

[518.] ORIOLUS KUNDOO. The Indian Oriole.

Rattray, J. B. N. H. S. xii. p. 330 (common on migration) ; Marshall, op. cit xiv. p. 602 (a summer visitor to Quetta) ; Watson, op. cit. xv. p. 145 (Quetta : common in gardens, mostly immature) . Fulton, op. cit. xvi. p. 49 (very common in summer in Chitral up to 8,000 ft.) ; Rattray, t. c. p. 426 (common near Murree at 5,500 ft.) ; Ward, op. cit. xvii. p. 479 (breeds in Kashmir up to 6,000 ft.).

A large number pass through Kohat in April and the beginning of May returning in August and September : many breed in the orchards of the Kurram Valley ; a few also in Kohat.

[528.] PASTOR ROSEUS. The Rosy Pastor.

Rattray, J. B. N. H. S. xii. p. 338 ('Thall: passing through in vast numbers) ; Marshall, op. cit. xiv. p. 602 (common at Chaman at the end of April).

Major Magrath has written the following note on this species in Kohat:— Passes through this district in vast flocks during the spring and autumn migrations. At the spring passage the birds are slaughtered in hundreds by the natives, every man possessing a firearm turning out for the sport. They arrive about the middle of April and the rush continues till the middle of May. The mulberries, which are ripe at this season, are eagerly devoured by them, and the ripe corn also suffers from their depredations. A few young birds remain in the district throughout the hot weather. The return passage begins about the end of July, being at its height by the middle of August, and lasting into September. Very few adult birds are to be seen at this time. The direction of the flight through the district is N.-W. and S.-E. for spring and autumn migrations respectively. The vast flocks which roost in and about the cantonments become an unmitigated nuisance while they are with us." Since writing the above, Major Magrath has noted the appearance of small flocks of adult birds in the middle of summer, as also have Captain Keen and I; in fact, between us we have noted them at short intervals throughout the summer, and it seems probable that some of them at least breed a good deal

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nearer India than Asia Minor. Small flocks of immature birds stay with us till November. Curiously enough, in the spring of 1907, only a few small flocks were observed passing through the Kohat district. The migration appears to have been diverted elsewhere, though whether this was due to the district being invaded at the time by vast armies of young locusts in the crawling stage, I cannot say. One would have imagined that this would have had an opposite effect.

[529.] STURNUS HUMII. The Himalayan Starling.

Rattray, J. B. N. H. S. xii. p. 338; Marshall, op. cit. xiv. p. 602 (rare at Quetta, shot in March and April); Ward, op. cit. xvii. p. 479 (very common in Kashmir in summer from 5,000 to 7,000 feet).

We must have overlooked this Starling. Colonel Rattray records it from Thall as "not common, but a fair number may be seen any day during April and May . . ." A Starling shot by me on the 14th of April (the last date on which a Starling was seen) proved to be *Sturnus menzbieri*.

[530.] STURNUS PORPHYRONOTUS. The Central Asian Starling.

Watson, J. B. N. H. S. xv. p. 145 (in flocks in Chaman, near Quetta, in December); Ward, op cit. xvii. p. 479 (does not appear to breed in Kashmir); Perreau, op. cit. xviii. p. 186 (occurs in Chitral).

62. ♂ ad Kohat, 1,760 ft., 4th January.

688. ♂ ad Kohat, 1,760 ft., 16th March.

719, 721. ♂ ♀ ad. Kohat, 1,760 ft., 21st March.

A winter visitor, not so common as the next species, occurring singly or in flocks, often in company with *S. menzbieri*.

As Dr. Sharpe has pointed out to me, both Major Magrath's examples from Bannu and mine from Kohat show signs of the mixing of this race with some other, the head being generally marked in places with purple gloss.

[532.] STURNUS MENZBIERI. The Common Indian Starling.

Rattray, J. B. N. H. S. xii. p. 339 (Thall; common in winter); Fulton, op. cit. xvi. p. 49 (Chitral; common winter visitor); Cumming, t. c. p. 687 (probably the Starling which occurs in flocks in Seistan in winter); Ward, op. cit. xvii. p. 479 (the majority migrate through, a few nest).

63. ♂ ad. Kohat, 1,760 ft., 4th January.

117. ♂ ad. ,, ,, 13th February.

718 & 720. ♂, ♂. Kohat, 1,760 ft., 21st March.

Abundant in the cold weather, arriving about the third week in October and leaving towards the middle of April.

[544.] TEMENUCHUS PAGODARUM. The Black-headed Myna.

Fulton, J. B. N. H. S. xvi. p. 49 (very common in summer in Chitral at 5,000 ft.); Rattray, t. c. p. 427 (rare in the Murree Hills); Ward, op. cit. p. 479 (occurs in Kashmir, but is rare).

A summer visitor to the district. I have only twice met with this species, once on the 25th of August, when I observed about a dozen feeding in a garden in company with the Common Myna, and again a pair on the 4th of June.

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Mr. Donald, the Political Officer, however, tells me that a few pairs nest regularly every year near Hangu (2,700 feet), usually selecting holes in the Boquain tree (*Melia azedarach*) as nesting-sites.

[549.] ACRIDOTHERES TRISTIS. The Common Myna. Rattray, J. B. N. H. S. xii. p. 339 (common and resident); Marshall, op. cit. xvi. p. 602 (a few occur in spring); Fulton, op. cit. xvi. p. 49 (resident in Chitral, occurring up to 8,000 ft. in summer); Rattray, t. c. p. 427 (common around Murree); Ward, op. cit. xvii. p. 479.

Resident and extremely common, occurring up to 7,000 feet in the Kurram Valley in the summer, and at Fort Lockhart (6,500 feet) all the year round, in spite of the heavy snowfall.

[551.] ACRIDOTHERES GINGINGIANUS. The Grey-Bank Myna.

Small flocks occur in the District in February and March, and are usually seen following cattle on the grass-farms. Major Magrath has found the bird fairly common in Bannu, and has sent an example to the British Museum.

AMPELIS GARRULUS. The Waxwing.

Whitehead, Bull. B. O. C. xxi. p. 19.

416. ♀ ad. Samana, 6,500 ft., 16th December 1906.

I first met with this handsome bird on the 11th of December, in a small garden near the Fort, but just as I had sighted it with my glasses, up flew a flock of Gold finches and began mobbing it, and away it went, uttering a soft whistling note. Five days later, on visting the same spot, I was lucky enough to again find a Waxwing there. It was in fine condition with four wax-like tips to the secondaries of each wing. In addition to this example, Major Magrath shot one, a male, extremely fat, in his garden in Bannu, lat. 33° (apparently the farthest southern record for this species), on the 20th of March. Colonel Ward records another secured on the 8th of the same month at 7,000 feet in Kashmir.

[*To be continued.*]

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A TAMARIX ASSOCIATION.

BY

WILLIAM BURNS, B. Sc. (Edin.).

(*From the Botanical Laboratory of the Agricultural College, Poona.*)

In the uncultivated areas along the banks of the Nerbudda near Broach run lines of tamarix. The zone occupied by this plant is comparatively narrow, but it is often possible to distinguish two regions within the zone, of apparently different ages, the older being higher up the banks. The tamarix is an organism well adapted to the conditions in which it occurs. These are sandy or alluvial soil, saline water, and a lowlying but rather exposed situation. It has been supposed that tamarix is rather a salt-plant than a sand-plant. How far this is the case remains to be proved. In any case tamarix occurs where both physical and physiological drought are imminent, and all its adaptations are for resistance of drought. The roots are deep, the leaves are minute and clasping, and on these leaves are peculiar impresso-punctate glands in which salts accumulate.

It is believed that the function of these deposits is to attract moisture hygroscopically from the atmosphere and pass it on to the leaf tissue. In the leaves of *Tamarix articulata*, according to Solereder, storage tracheids occur for the preservation of water.

I was curious to know what other plants were associated with the tamarix in its peculiar zone at Broach and so, in October 1909, I collected from a small area (about 100 by 15 yards) all the plants I could find. Where the tamarix grew it was the dominant plant, but the habit of the tamarix is not such as to exclude the growth of other plants amongst it. The area I examined was of recent growth and close to the water. The tamarix was from three to five feet high and thickly planted, yet the slenderness of its branches permitted sufficient air and light to enter for numerous subsidiary plants. In marked contrast to the tamarix in this respect was *Typha angustata*, of which I found one clump growing in a swampy spot where no tamarix had rooted. This Typha formed a compact and exclusive community, growing so close and high that nothing else had a chance amongst it.

Of tamarix I found three species, namely, *Tamarix dioica*, *Tamarix articulata* and *Tamarix ericoides*. These were all in flower and easily identified. *Tamarix ericoides* has ten stamens, whilst the other two have five. *Tamarix dioica* has unisexual flowers, whilst *Tamarix articulata* has hermaphrodite flowers in interrupted spikes. Two other species are reported in Cooke's Flora as occurring in Sind, namely, *Tamarix gallica* and *Tamarix stricta*; but these were not found in the Broach group. *Tamarix gallica* has five stamens like *Tamarix articulata*, but has racemose panicles. *Tamarix stricta* has ten stamens like *Tamarix ericoides* but differs in having the glands of the disc passing into the bases of the staminal filaments instead of separating them. *Tamarix dioica* and *Tamarix articulata* become tree-like in habit. *Tamarix*

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ericoides remains shrubby. The distribution and biology of these species will be the subject of further study.

The following is a list of the plants found amongst or beside the tamarix with the exception of one or two lost in drying :—

LYTHRACEÆ :	*Ammania salicifolia.*
COMPOSITÆ :	*Ageratum conyzoides.*
	Eclipta alba.
	Sphœranthus indicus.
FICOIDEÆ :	*Trianthema monogyna.*
AMARANTACEÆ :	*Achyranthes aspera.*
	Celosia argentea.
	Amarantus paniculatus.
	Alternanthera sessilis.
GRAMINEÆ :	*Chloris montana.*
	Eragrostis pilosa.
	Eragrostis interrupta.
	Panicum colonum.
	Isachne australis.
	Andropogon halepensis.

For the identification of these plants I am indebted to Messrs. Bhide, and Paranjpe, Assistant Economic Botanists, Agricultural College, Poona.

The *Lythraceæ* are subdivided by Hooker into two tribes, the *Ammanieæ* and the *Lythreæ*. The *Ammanieæ* are a distinctly moisture loving group.

Several of its members are weeds of rice fields. I have found *Ammania* species in damp saltish lands in the Konkan and near Baramati. The species found at Broach, *Ammania salicifolia*, is exceedingly widely distributed in India, being reported from practically every province. According to Solereder, the *Lythraceæ* very often have epidermal mucilage cells in the leaf. The genus *Ammania* possesses these and they have doubtless some biological significance.

The *Compositæ* found are of wide distribution in all warm climates. *Ageratum conyzoides* and *Eclipta alba* are common weeds of fields and waysides in India. *Sphœranthus indicus* is reported in rice fields.

The distribution of *Trianthema monogyna* is also very wide. It is found in Malaya, Western Asia, Africa and Tropic America. The anatomy of the *Ficoideæ* has been the subject of repeated study. The stem structure has been shown to be anomalous. Successive arcs of meristem appear in the pericycle giving rise to concentric rows of secondary vascular bundles and intermediate tissue (Morot). As an adaptation to the dry regions which the members of this order inhabit, they are provided with water storing cells in the leaf epidermis.

The *Amarantaceæ* cannot be said to be distinctly haloplytic or xerophytic though they can put up with fairly dry conditions. The *Amarantus paniculatus* found was a single specimen, probably an escape. It was small, only about thirty centimetres high, with no fasciation. *Achyranthes aspera* is a well known

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weed in dry places all over Tropic Asia, Africa, Australia, and America. *Celosia argentea* has an almost equally wide distribution and is a common field plant in India. *Alternanthera sessilis* is fond of damp places throughout the hotter parts of India and Ceylon. The stem structure of the *Amarantaceæ* is similar to that of the *Ficoideæ* in having concentric rings of vascular tissue (see Solereder and others).

The *Gramineæ* cited are all of very wide distribution and inhabit all sorts of situations. Dalzell and Gibson give *Eragrostis interrupta* as occurring in waterholes in Gujarat.

The analysis of this Association brings to light one or two curious facts. The first is that, in one Association, we have, growing side by side—

(1) plants of limited habitat and xerophytic or halophytic type—*Tamarix* species.

(2) plants of general xerophytic type—*Trianthema*.

(3) plants of the open field and of no distinct type—the grasses, composites, and *Amarantaceæ* other than *Alternanthera*.

(4) plants of distinctly hygrophytic type—*Ammania salicifolia*, *Alternanthera sessilis*.

The occurrence of a general xerophytic type along with the tamarix is to be expected. The occurrence of the plants of the open field shows that these have a long range of adaptability. The occurrence of hygrophytes points, I think, to an invasion of odd dampish corners by plants accustomed to these situations.

A second interesting fact is that all the plants associated with the tamarix are plants of exceedingly wide distribution throughout the tropics. Wide distribution of a species indicates considerable flexibility of constitution, and it is precisely such plants that one would expect to find in conditions so trying and special as those among the tamarix.

A third point is the occurrence of the several *Amarantaceæ* and of *Trianthema*, all with anomalous stem anatomy. I hardly think we can as yet say that this structure means any special advantage in gaining a foothold in unusual situations.

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A NOTE ON THE CIRCULATION OF *CALYCOPTERIS FLORIBUNDA*.

BY

JOHN WALLACE, C.E.

In the early days of the Indian police the way in which law breakers could remain in the jungle, at seasons when all springs and streams were dry, and when the village wells were watched, was very puzzling to the authorities. Travelling through jungles or over uncultivated and rocky ground in hot weather, and without drinking water, is a serious hardship, as many a shikari knows to his cost, but the mystery was cleared up when it was discovered that drinking water could be had from one of the largest climbing plants, the *Calycopteris floribunda*, that is common in many parts of India and may even be seen in and around Bombay. Examples are found on Gibbs Road, Malabar Hill, outside the Bombay Gymkhana and also on the lawn in front of the University Library, where a fine example of the plant grows upon an isolated Pepul tree.

The "Ukshi," as the plant is called in the Thana District, is known in two forms; as a scandent plant in the jungles where it climbs the whole of trees, turning from left to right, forming great loops and festoons and reaching long distances from one tree to another, or travelling along the ground for the same purpose, and meanwhile throwing out roots to form new plants. At times it will also send out fresh shoots from the ground which will coil so tightly around its older stems as to present the appearance of a hard twisted rope. Its other form is that of a dense shrub when isolated and cut annually for twigs and leaves, which are burnt on rice fields as manure. At the commencement of the hot weather its pale golden flowers form a pleasing contrast with the surrounding foliage.

The chief interest of this plant lies in its property of storing water, and in the means by which this water is raised, stored and distributed. Mr. George Ryan of the Indian Forest Service described the *Ukshi* in a paper read before this Society, on the 29th September 1904, and told how four pieces of stem, totalling 9 feet 8 inches in length, and of an average diameter of 3½ inches, discharged when newly cut one quart of clear potable water. This water tends to rise in the stem above the incision under the influence of some unexplained force. The wood of the *Ukshi* is stringy, and filled with unusually large water vessels which may be seen in the cross sections exhibited. These sections when held against the light have the appearance of a delicate textile fabric sparkling with luminous points. The cutting of them presented some difficulty, as sawing produced a woolly surface, and sand-paper only filled all the pores with dust. They were finally sawn nearly to size, fixed in a lathe, and cut with keen edged chisel which was held with a vertical edge. The upward movement of the water in the *Ukshi* represents a considerable force, for the surface resistance of the innumerable vessels must be very great, even if the movement of the

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water be very slow. The water helps to feed the plant with mineral solutions on its way to the leaves from whose surface it escapes by evaporation at a varying rate, according to the season or time of day. Botanists seem to agree in saying that plants have no organs for absorbing water or vapour through the leaves. The movement of water must therefore be always in one direction which would seem to imply the existence of some kind of valve on the surface of the leaves, which prevents a reverse movement, even when under the influence of atmospheric changes of temperature and pressure. In Bombay we learn from figures kindly furnished by Mr. N. A. Moos at the Observatory, that the mean monthly solar radiation as recorded by the black bulb thermometer in the month of January, is 133·5 degrees Fahrenheit and that the minimum grass radiation thermometer at night indicated 62·5 degrees, shewing a range of 71 degrees to which plants are exposed. These are only mean figures. In Allahabad the sun temperature rises to 163 degrees, giving in all probability a much greater range. Confined air under an increase of temperature equal to 71 degrees would increase in pressure by about 2·8 lbs. per square inch or approximately 403 lbs. per square foot. The range of barometric pressure in Bombay is small as compared with that of other countries. It occurs in two daily waves having their maxima at ten o'clock, morning and evening, and their minima at four o'clock, morning and evening. The maximum range is equal to a column of water 7·936 inches high, which corresponds with a pressure per square foot of 41·98 pounds. The atmospheric influence acting on the *Ukshi* are thus a wave of temperature, rising from sunrise until half past two o'clock in the afternoon and falling until sunrise; and two waves of barometric pressure of an amplitude already indicated. It is hard to believe that such forces, acting on the outside of a plant, whose juices have to be raised against gravity and friction, should have no useful influence in assisting its functions. This assistance would seem to involve the existence of valves, and as this matter has been the subject of contrary opinions there is still a lack of unanimity about it. Col. Kirtikar recently examined a vertical section of a local fresh plant, and observed that it has innumerable pitted cells which Prof. Strasburger of Bonn University in 1903 found to act apparently as valves.

We all know that it is not the heart alone that circulates the blood in an animal body, because the whole work, if thrown on that organ alone, would rupture it. We may with safety assume that the water column circulating through the comparatively wide vessels of the *Calycopteris floribunda* are not continuous, and it remains for us to ascertain exactly the form of interruption which supports the water column, and the extent to which the meteorological changes, above referred to, affect the circulation of the plant whose extremities are open to absorption of water at the lower ends and to evaporation of moisture at the upper ends, while both extremities, owing to their conformation, do not permit a reverse current. It seems as if the regularly recurrent changes of temperature and pressure represent forces sufficient to carry on the work of circulation if the organs of the plant are adapted to utilise them.

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REVIEWS.

THE FAUNA OF INDIA—DERMAPTERA.

BY M. BURR.

This, the latest volume of the series, and the first under the editorship of Mr. A. E. Shipley, deals with the Earwigs, *Dermaptera*, better known as the *Forficulidæ*. The new editor writes a preface which details the new volumes in preparation which we may notice before dealing with this volume.

Volumes have been sanctioned as follows :—

1. *Cicindelidæ* and *Paussidæ*, with a general introduction to *Coleoptera* by W. W Fowler.
2. *Orthoptera*, by W. F. Kirby.
3. *Dermaptera*, by M. Burr. (Now issued.)
4. Butterflies Vol. III.
5. *Curculionidæ*, by G. A. K. Marshall.
6. *Cetoniidæ* and *Dynastidæ*, by G. Arrow.
7. *Ichneumonidæ*, by C. Morley.
8. *Longicornia*, by C. J. Gahan.
9. *Buprestidæ*, by E. P. Stebbing.
10. *Rhynchota*, Appendix. W. L. Distant. (In the press.)
11. *Blattidæ*, by R. Shelford.
12. *Mollusca* II, by Godwin-Austen.

The above volumes have been sanctioned but are not all likely to be seen. The first is apparently not commenced nor is material called for ; the second has been in preparation for years and is not likely to be prepared, although collections for it have been in England several years. The fourth, the concluding volume of butterflies, *Lycænidæ* (part) and *Hesperiidæ*, is in the hands of Mr. Druce and much material is available. The fifth is under way and Mr. Marshall has worked through part of the material to the great advantage of Indian collectors. Mr. Arrow has examined the material for the *Cetoniidæ* and *Dynastidæ* and Mr. Morley has been at work on the *Ichneumonidæ* ; we have no knowledge of the *Longicornia* beyond the fact that one volume has appeared and that collections for the second have not yet been called for. The *Buprestidæ* are not likely to be done at present. Mr. Distant's volume on the *Rhynchota* is almost done, owing to his untiring activity in describing species and for Mr. Shelford's volume no collections have as yet been called for. The editor makes no mention of a volume on *Microlepidoptera*, for which Mr. E. Meyrick has for years been describing material in this journal, but the matter is so enormous, one volume will not suffice.

The Fauna of India is of immense service to Indian workers and it behoves all workers in India to help in any way they can. In response to an appeal

* The Fauna of British India, including Ceylon and Burma—Dermaptera. M. Burr. (Taylor and Francis, London.)

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for beetles recently issued by this Society, much material has been received which is being pinned, set, identified and the new material arranged for the furtherance of the future Fauna volumes. In view of the above projected volumes, we would urge that members should collect insects likely to be of value for these volumes. The appeal for beetles has met with a good response; we would appeal now for cockroaches, grasshoppers, locustids, stick insects, mantids and especially crickets. These are, with the beetles, the really important groups required now; it should be needless to say that collections of *Licanids* and *Hesperiids* are badly wanted, but this will appeal only to butterfly collectors, while every member can collect and send in the other groups, notably the crickets and grasshoppers. Members of this Society alone in India can help in this work and can assist in providing the material on which the volumes will be provided; when a volume is projected, its ultimate value depends very largely on the fresh material available for examination and this can be supplied very largely by the members of this Society.

Turning to the present volume, we would congratulate the author upon it: the general introduction is extremely good, taking account of the life-history and habits in a way rare among authors of systematic works. The author describes 133 species of earwigs of Ceylon, India and Burmah, and gives a revised scheme of classification. He appeals for more material, as there are many questions unsettled, and he takes a broad view of the value of the present classification. Like other specialists he is desirous of emphasising the importance of his group and makes it an order under the term *Dermaptera*. The section on geographical distribution is notable and the paragraphs on determination of species form a feature of the utmost value, as former volumes have been really used only by trained entomologists very largely because the layman could not get an explanation of the terms used in the volume; Mr. Burr's paragraphs make the volume one that can be used at once by any one who will take the trouble to master the introduction and carefully read this section.

The author describes 133 species from India, Burmah and Ceylon. Of these, 32 are from widespread localities in the Himalayas, Ceylon, Burmah and other subtropical areas, 30 are from Burmah alone, 18 from Ceylon alone, 25 from Himalayan localities only, 6 from Burmah and Ceylon alone, while 20 only are recorded from localities in the plains of India, *i.e.*, from tropical India as I understand it. The species recorded from tropical localities are usually also found in subtropical areas, and there is practically nothing found in tropical India which is peculiar to it in the sense that the 25 Himalayan species are, as at present known, only Himalayan. *Forficulidæ* are not a large part of the fauna of the tropical plains but are more abundant in species in moister hill areas. Our Forficulid fauna in the plains is a "derived" one of recent times, not an indigenous "original" one.

The volume is well illustrated with text diagrams and ten plates, one in colour. We trust it will stimulate workers in India to turn to the *Orthoptera*,

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not for collecting only but for the observation of habits, season and life-history. The Society will be glad to receive specimens, to name what they can and to collect all the material possible for future volumes of the Fauna.

H. M. LEFROY.

"INDIAN INSECT LIFE."

A MANUAL OF THE INSECTS OF THE PLAINS (TROPICAL INDIA).

By H. Maxwell-Lefroy, M.A., F.E.S., F.Z.S.,

Assisted by F. M. Howlett, B.A., F.E.S.

Twenty-five years ago there was very little available literature on Indian Entomology and the new arrival in the country, however enthusiastic in the pursuit of insects and their ways, soon found his ardour evaporate under the continued disappointment of not being able to determine or put a name to any of his captures. At least this was true of everything except, perhaps, butterflies. Even about these, there was only Marshall and de Nicéville's partially completed work to be had. And this was expensive. On Beetles and Flies, on Bugs and Grasshoppers and Dragonflies, &c., there was nothing, absolutely nothing. In 1888 the Government of India authorised the compilation of "The Fauna of British India, including Ceylon and Burma" dealing, in a series of volumes, with the zoology of the countries mentioned. Up-to-date several volumes on Insects have appeared and these constitute so far the only works published dealing exclusively with Indian Entomology by means of which captures can be named. But as yet very few families of insects have been treated in those books and the field entomologist is to-day nearly as badly off as he was a quarter of a century ago. The study of Insects has been tremendously advanced in the last twenty years but nearly all the information gathered is disseminated throughout Europe in the different journals or magazines of the Zoological and Entomological Societies. Little of it is therefore available to the working entomologist. The "Fauna" above mentioned has as yet dealt only with the Moths, the Butterflies, the Bugs or Hemiptera and a few of the Coleoptera, none of which have been completed at the present hour. No attempt had been made to deal with Indian Entomology as a whole or for any considerable part thereof until Mr. Maxwell-Lefroy published his "Indian Insect Life" last year. It is not necessary to say that the want of such a book has been felt for many years back. There was no one before with sufficient leisure or sufficient energy to write it. There have, of course, been good entomologists in this country in the past but most of them have been Government Officials who were only able to pursue the subject as a hobby in the intervals of their legitimate duties. Mr. Lefroy has been luckier, being an Entomologist by profession, employed by the Government of India under the title of Entomologist, Imperial Department of Agriculture for India, with a good library of reference at his disposal, a sufficient staff of artists and a good

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type collection of material to work on. All these are requisites not available to the ordinary individual. There is no wish or intention of detracting from the worth of the work done by him in the compilation of the book under review, but he has had exceptional opportunities, and he has produced an exceptionally able treatise.

From the first page to the last "Indian Insect Life" is as perfect a work as could be expected with the knowledge of the subject dealt with attained up to the present day. It is replete with information imparted in a pleasant and lucid style and contains a great amount of matter which in the past has been only available to the very few. The subject dealt with is a very large one and it is surprising how the author has managed to get all the facts and observations he has alluded to into the space he has allowed himself. The book is, naturally, largely a compilation, as can only be, but there are many original observations and notes incorporated in it and the fact that all the material has been collected in a short six years reflects infinite credit on the writer and those who have helped him.

It is a book of some 800 beautifully printed pages of good stout paper, and 536 text-figures besides 84 full page plates of which a great number are coloured. There is a map of India as Frontispiece showing the region dealt with which, we are informed, is the Tropical portion only or the "Plains." The cover is pretty and original, simple but very suitable. The binding, however, is bad; it is not strong enough and the pages break loose and come out. This is probably the result of weight and it would have been better had the book been issued in two volumes instead of one. It would have been a great deal handier also were it of smaller size notwithstanding that this would have interfered with the area of the fine plates; but the advantage gained in convenience of handling would have perhaps more than compensated for this. The objection to reduced plates could have been got over by multiplying their number, though this would have of course increased the cost of production. The final result might, however, have been more satisfactory in that there would probably have been a greater sale for the work in the more convenient form. The wider circulation it has the better for everybody.

The text-figures are uniformly good and, in the majority of cases, they represent typical insects, their eggs, larvæ, cocoons, nests, &c., and should be of considerable use to those desirous of learning to distinguish between the different forms. The plates, both coloured and uncoloured are on the whole also good; some of them are excellent and should be a great help to the beginner. They represent insects in all stages, many of them magnified, their eggs, larvæ, chrysalides, imagines, cocoons and foodplants; in many cases accompanied by the parasites characteristic of each. The plate of lepidopterous larvæ (XXVIII) contains caterpillars of some common types of butterflies and moths some of which have been apparently wrongly identified. For example, the larva No. 1 is given as that of *Junonia orithya* while it is evidently that of *Hypolimnas bolina*: both are nymphaline but differ in

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that the head of the former is never horned; the colour is also slightly different. The figure No. 6 is said to represent a sphingid moth larva but it is not true to life having no horn on the 12th segment: the eighth abdominal segment. It is evidently one of the *Chærocampa* or *Theretra* class by the attenuated fore-part and the thickened thoracic segments, but none of these caterpillars are without the horn on the eighth abdominal segment. Plate X is badly executed; the wasps depicted are all too pale in colour, the lines are coarse and the colours are bad; the same may be said of Plate XIII. Although the figures are enlarged, which might account for a certain amount of apparent coarseness, still they compare very unfavourably with the figures in, for example, "Genera Insectorum." Plate XVI (upper half) is perhaps the worst of the lot; the beetles look more like hedgehogs than anything else. However it is perhaps unfair to carp at the few bad pictures when there are so many of them, in fact the very large majority, which are so excellent. There are none that are not recognizable at a glance for what they are intended to represent and many of them are very perfect. The coloured plates of the locusts are extremely good.

The amount of information contained in the book is very great and the whole of it is exceptionally accurate; the arrangement of the matter is very good and complete. The introduction is an able exposition of the whole subject treated of. General entomological questions affecting sex, duration of life, relations to flowers as influencing cross-fertilization of plants, relations of insects to each other such as the habits of certain groups connecting them with ants, protective colouring and shape, &c., are treated of in appropriate places throughout the book, in short well written articles full of interest. These articles add to the value of the work from all points of view; they draw attention to most that is known about the ways and habits of insects, suggest many points that require study and elucidation and impart quite a large amount of information in a very small space.

Mr. Lefroy has produced a very valuable work that marks a distinct advance in Indian entomological literature. His name will be remembered for long years as the writer of the first text-book on Indian Insects, and "Indian Insect Life" will be the only source of information available to schools and colleges in this country for the next dozen years. Would that it had been published before. May it have the sale it richly deserves.

"INSECT INTRUDERS IN INDIAN HOMES."

By E. P. Stebbing.

Mr. E. P. Stebbing has written a little book entitled "Insect Intruders in Indian Homes" which, he informs us, in the Foreword, is "a modest and altogether popular account of a few of the commoner Insect Intruders" met with in homes, gardens and jungles in this "Land of Exile." It is quite prettily got up, is illustrated with many illustrations of the subjects dealt with on a very broad margin of page round a somewhat meagre column of print, an

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arrangement which, however, undoubtedly adds to the fresh look of the whole. It rejoices in a somewhat stiff though ingenious title-page, a rather artistic reverse side to the covers, a dedication-page backed by quite a long list of authorities consulted and a page with the quotation "To the solid ground of Nature trusts the Mind that builds for eye." There is list of Contents, a Foreword and an Introduction. All this *plus* the three Chapters into which the real book is divided occupy 158 half-pages of large clear print. The paper is good and the binding also.

The illustrations are, on the whole, good though some of them are somewhat rough and stiff. Many of them are unnecessarily repeated. They are placed so as to represent the insects alluded to on the page on which they are depicted and are easily recognisable as well-known types. The author deals only with types of "Intruders" and abstains from mentioning scientific names. He does this on purpose in the interests of "popularity." We take this to be a mistake. It would have been easy to give names without in the least detracting from the interest of the book for the lay reader, while it would have greatly added to its value for the scientifically inclined individual. As it is, the insects alluded to represent nothing definite to either the one or the other except known by sight.

We have perused the book more than once. We have given it to friends to read so as to have the opinions of people acquainted with insects only as insects; that is in the popular way, not scientifically. They pronounced it to be pleasant chatty reading well fitted to while away an idle hour. Perhaps it is, but personally we think the grammar often faulty, the style artificial and the humour decidedly forced. In a vague way it reminds one of the writings of EHA, as if the author had tried to imitate him. But what a difference! The allusions to insects as "little chaps" and "beggars" and "he" gets monotonous and jars. We also wish the author had abstained from introducing "The Girl" who gets upon our nerves and comes as a shock each time she is mentioned.

On page 44 he refers to a *Megachile*—departing from his intention of avoiding scientific terms—which makes mud nests and provisions them with pollen. We wish he could have told us more about the insect, for a Leaf-cutter bee that builds free mud cells for itself like an *Odynerus* or *Eumenes* wasp is decidedly interesting. We know *Megachile* bees will take possession of the mud cells of other wasps and make use of them, sometimes lining them with leaf pieces; but we were ignorant of their constructing such things independently. In fact we always considered that the Hymenopter that built a mud nest for its eggs in India could not and must necessarily be a wasp and not a bee, and this notwithstanding the example of *Chalicodoma* described by Fabre. Perhaps the *Megachile* alluded to lines natural cavities, tubular holes and so on with mud—that would be not quite so surprising for other *Apidæ* do that.

What are "Fossorial parasitic Wasps" mentioned on page 48? From the habit of storing spiders the author evidently means Fossorial Wasps; none of

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the spider-storing ones are parasitic of course. On page 58 he mentions the Sawfly larva, figuring an ordinary moth-larva in the margin ; on the next page, by misplacement of a comma, he has made the difference of the number of legs possessed by a moth larva and that of a sawfly somewhat difficult to understand. When talking of "a silky little black beggar vividly picked out with orange and red and white spots and little stripes" on page 65, he describes it as being "pretty well omnivorous" which is another misstatement. The moth larva alluded to is that of *Polytela*, probably *gloriosæ* and it feeds only upon lilies. Mantis egg-masses on page 113 are said to be "easily crumbled between the fingers". As a matter of fact they are exceptionally tough except when very old and weathered. The little holes are made by parasites and not by the young emerging Mantis brood ; these slip out between little edges, proceeding from the successive layers by which the mass is built up, overlying each other generally down one side.

TRANSACTIONS OF THE BOMBAY MEDICAL CONGRESS, 1909.

It is a matter of every day knowledge that within the past half-century the Science of Medicine and the Art of Surgery have been well-nigh revolutionised by the study of one branch of Natural History, to wit, Bacteriology.

A glance at these Transactions will convince the reader of a much less known fact. Medicine, especially in the Tropics, owes most of its advances during the past quarter of a century to the Science of Zoology.

Year by year one disease after another has been found due to some minute animal parasite, and others, though perhaps caused by vegetable organisms, like the bacteria, owe their transmission to some specific animal host or carrier.

Medical research in the tropics has therefore become largely the study of Biology or the Life History of particular parasites, or particular animals concerned in the transmission of disease. Omitting such obvious diseases as those due to snake poison, intestinal worms, to vermin, such as lice, "jiggers," itch mites, guinea-worm, etc. we find malaria, chyluria, sleeping-sickness, "kala-azar," the black fever of Assam, hæmaturia of Egypt, relapsing fever, tick fever, syphilis, yaws, Delhi boil or Aleppo evil, miner's anæmia, the "anæmia of coolies", which causes such havoc in Ceylon and Assam, the enlarged liver of Japan are all now proved and universally admitted by pathologists to be directly due to animal parasites.

Most pathologists believe that Elephantiasis is caused by a minute worm transmitted by the common Culex mosquito, that most cases of liver abscess and one form of dysentery are due to a specific animal parasite, an amœba. They are most certainly associated with it.

Of late most protozoologists and cytologists have come to the conclusion that certain minute bodies found in the skin and throat during scarlet fever, those found in the vesicles of small-pox and cow-pox, others found in the nerve cells during rabies and hydrophobia are minute animals, the living contagium, the exciting cause of those diseases.

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No one now disputes that Malta fever is transmitted by the goat, malaria by one family of mosquitoes, chyluria by many mosquitoes, and yellow fever by one species, sleeping-sickness by the Tse-tse fly.

Evidence has been brought forward that relapsing fever and kala-azar are transmitted by some biting animal, probably the bug or the louse.

Before re-infecting man many parasites require to pass through some intermediate animal host, the recognition and destruction of which are important matters for the medical man and sanitarian.

The life history of the malarial parasite in mosquito and man must now be "familiar to every school-boy." The agency of rats and fleas in the transmission of plague is sadly familiar to most of us in India.

Less well-known is the fact that the embryos of the guinea-worm on leaving man pass through a stage in the body of a small crustacean, Cyclops, that the Liver-Fluke which in Eastern Bengal is not uncommon in man, almost universal in sheep and goats, must of necessity pass certain stages of its life in the common water snail.

After this introduction we feel no need to apologise for the lay Naturalist venturing a little friendly criticism on the work of an Indian Medical Congress.

From a Natural History point of view, we must confess we have found little that is new or original. As a work for reference, the volume, a portly quarto of 632 pages, is rendered almost useless by the absence of an index. This want is the more obvious, as the sections into which the Congress was divided, were based on no recognised method of classification, pathological or otherwise.

We venture to think the editor would have been well advised to have had an index drawn up rather than occupy the space devoted to an Editor's Preface "to enumerate briefly some of the principal lessons which have been gleaned from the deliberations," and to appraise after the manner of a Commander-in-Chief in despatches, the value of different contributions.

The various authors might well resent as a usurpation the assumption of this role by the one official whose onerous and well-carried-out duties must of necessity have prevented him from hearing the majority of the papers and the criticisms published and unpublished which they evoked.

We doubt if many physicists will agree with the Editor's commendation of the evidence given in support of a theory that Hill diarrhœa is due to diminished atmospheric pressure.

In the department of Natural History a paper on Trypanosomiasis and Tse-tse Flies by Captain Greig, an observer who had lately returned after much practical research in Africa, is "mentioned in despatches" by the Editor as merely "exhaustive." We venture to think our readers will find it the best account written of what is known on the subject at the present day.

On the other hand the Editor pronounces "important" a paper by Dr. J.

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T. Nash on the Non-Biting Flies, in which we must confess we cannot trace one new or original observation.

A good and popular account of some Indian Sand Flies is given by Mr. Howlett, who also contributes a useful table with helpful diagrams of the Blood-Sucking Flies, which has modestly concealed itself at the back of the volume in a "Catologue of Exhibits."

The discussion on the Treatment of Snake Bite would seem to have been a lively one, and will doubtless have an interest for the field naturalist. A startling line of treatment is recommended by our own valued contributor, Major F. Wall, which we would take for a slip of his facile pen but for the fact it is twice repeated. As we find no comment from the numerous keen critics present, we doubt if his advice can have been read at the meeting. He advises in all cases of colubrine and viper poisoning when the appropriate antivenene cannot be obtained, "*the intravenous injection of* 350 *c. c. of a 5 per cent. solution of Permanganate of Potash*" ! ! !

As this is the equivalent of half a gallon of undiluted Condy's Fluid, the immediate effect of which would be to coagulate all the blood with which it came in contact, it is needless to say the patient would be dead long before the injection was completed.

Simond's theory that plague is mainly transmitted by rat fleas, the truth of which he had established for most observers in 1898, but which the Indian Plague Commission dubbed "hardly deserving of consideration," seems to have been generally accepted at the Congress.

Long papers on water supply were contributed by Dr. Dadachanji, the scientific value of which may be judged by a single paragraph. "The terrible scourge of cholera in London in 1854 was believed to have had its origin in the upturning of the earth in which the plague-striken victims of the year 1665 had been buried." Truly a striking phenomenon in evolution, the *Bacilus pestis* of 1665 developing into the *Comma vibrio* of 1854 ! ! ! Lengthy papers on the sanitation of Bombay by Drs. Cursetji and Master are illuminated by flashes of unconscious humour and the play of a little poetic license. They tell us the City of Bombay "in every respect the pioneer City of India "having *enterprising and intelligent citizens* and being ahead of most of the "other cities in adopting the latest and newest measures for its sanitary "improvement and owned extensive water-works, the largest and most costly "of their kind . . . perhaps in the whole world."

Having given us this and other original information, on the very next page they fall foul of the Municipal Executive. "The peculiar habits and customs "of the *people born of sheer ignorance and stupidity* must have surely been "known to the Municipal Executive for over so many years," and we learn that there is practically nothing good from a sanitary point of view in Bombay.

The impression left upon us by the whole 160 pages devoted to Sanitation in India is that they could have been conveniently condensed into a Chapter like that on 'Snakes in Ireland,'—"There is no Sanitation in India."

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Interesting as a psychological study may be mentioned, Dr. Kulkarni's remarks on page 158 on the comparative value of cow-dung and buffalo-dung in the prophylaxis of "all diseases." Interesting from the same point of view, and we should have thought deserving of some special award from the Congress is Sir Bhalchandra Krishna's statement that in *all cases of plague* treated by him with serum "success had been invariable." So mote it be!

Of the purely Medical and Surgical matter in this volume, we are not competent to offer any criticism, such would doubtless be out of place in a Journal of Natural History.

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MISCELLANEOUS NOTES.

No. I.—THE CALL OF THE SLOTH-BEAR.

Mr. Roscoe Allen's interesting Note on the Call of the Sloth-Bear in the last Journal (p. 745) reminds me of an incident which may be of interest to him and to other readers of the Journal. In February 1904 I was in camp among the foot-hills of the Bara Pahar range in Sambalpur district, which was then part of the Central Provinces, but is now a district of the Orissa Division of Bengal. I had 16 kills out for a pair of man-eaters which were known as the Ambabhona Tigers.

My tent was open as the weather was warm, and one night about 1 A. M. I heard a call which was quite unfamiliar. It was, as Mr. Allen describes it, a long-drawn and rather melodious note. Near my tent were sleeping my Shikari and Khalasi, both of whom had been out all day inspecting the buffaloes tied up. I found both asleep and did not wake them. The same call was repeated, and I located it in a steep hill north of my camp. I heard no answering call, and went to sleep.

In the morning an old Binjhal from the village came over to tell me about it. He had been awake too. He described it as the sex-call of the she-bear and said that she evidently was calling up her mate from a great distance, three "*kos*" at least.

I wished to go out at once, but the sun was already well up and the old Binjhal said that we could safely wait till evening. His argument was "She would not have called him up from a distance, if she had not found very good feeding. They will be on this hill for two days."

In the evening I found both bears feeding on the reverse of the hill in thick jungle. The male got away wounded, but the she-bear got my second-barrel in the neck and died, after throwing herself savagely on her mate and biting him. He, when wounded, did not attack her.

F. DEWAR, I.C.S.

CAMP: BALAGHAT, C.P.
7th January 1910.

No. II.—DISTRIBUTION OF THE SLOTH-BEAR OR INDIAN BEAR (*MELURSUS URSINUS*).

It is stated in the *Fauna of British India—Mammalia*—by Blanford, that the Sloth-bear is found to the West of India, in *Kathiawar*, and has occasionally been met with in Cutch. As regards Cutch, I am unable to advance anything; but I can safely say that it is not to be met with, nor as far as I am aware has it ever been so, in the Province of Kathiawar. It is difficult to conjecture what reason there can be for its absence. as many parts of the Gir forest are just the places, one would suppose, for holding bears. The same remark applies to

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the tiger. I have questioned many an old inhabitant of the Gir, but not one of them ever remembered to have seen, or ever even to have heard of one in the district.

This is the case also with the jungle and spur fowls. There are none in the Gir.

L. L. FENTON, LT.-COL.

SOUTH MOLTON, NORTH DEVON, ENGLAND.
8th January 1910.

No. III.—THE BALUCHISTAN BEAR.

This bear is identified by Blanford in his *Mammalia* (*Fauna of British India*), as *Ursus torquatus, i.e,* the Himalayan Black Bear, which has the inverted white crescent or horse-shoe mark on the chest.

Some years ago when shooting in the Pubb Hills on the Sind border, I was informed by a local authority that the Baluchistan bear locally known as the *Mam* carried no horse-shoe mark. I did not go far enough north to find a *Mam*, and was unable therefore to personally verify the statement.

It is an interesting point on which perhaps the Superintendent of the Karachi Zoological Gardens, or a local Member of our Society may be able to throw some light? I am told that specimens of the animals were to be seen at the Gardens a few years ago, and if it is a fact that they were not possessed of the horse-shoe marks, it would seem that they are entitled to be classed as a separate variety?

L. L. FENTON, LT.-COL.

SOUTH MOLTON, NORTH DEVON, ENGLAND.
8th January 1910.

[This is a point which perhaps the Baluchistan Natural History Society may be able to definitely settle.—EDS.]

No. IV.—A RECORD PANTHER.

According to a short paragraph in the *Indian Field* for March 10th, a panther measuring 9 ft. 3 in. was shot by a villager at Uttar Khasi, Tehri State. Into Rowland Ward's *Records of Big Game*, the largest panther mentioned measures 8′ 6″ but this animal exceeds that measurement by 9 in. If any Members should have heard or can find out further particulars about this large panther, we shall be very glad to hear from them.

At the same time we should like to call attention to the fact that in all records of the measurements of tigers, panthers, etc., it should be distinctly stated what the measurements of the head and body are and how much the tail measures, also whether the head and body has been measured between uprights or not.

The head and body measurement of a panther give a much better idea of its size than that of the total length, since there is a considerable variation in

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the length of the tail. For instance, Jerdon records a panther measuring head and body 4′-9″ with a tail of 3′-2″ and in *Shooting in Cooch Behar* one is mentioned with head and body of 4′ 9″ and a tail of 2′ 9½″. Surely from these measurements a far better idea is got of the sizes of these panthers than if they had been given as measuring 7′-11″ and 7′-6½″ respectively in total length.

BOMBAY NAT. HIST. SOC.
6, APOLLO STREET,
BOMBAY, *April* 1910.

N. B. KINNEAR,
Keeper of the Museum.

No. V.—JACKAL HUNTING WITH WILD DOGS.

During March last my two shikaries while proceeding to tie up a goat as a "kill" for panther met a small pack of wild dogs on the high road. I had warned them to be on the look-out for the pack and take a gun with them. The dogs sneaked into the jungle as soon as they saw the men, and the latter tied up the goat at the side of the road and climbed on to a large boulder out of sight As soon as the goat began to bleat, the pack came up and the men shot this animal (skin and skull sent) as it was about to attack the goat with another. They also wounded another one which came out on to the road about 40 yards down to have a look at the goat; they describe the last one as very red and big It got away. I send you this skin and skull, because I think that the animal is a jackal. I have questioned the men closely, and they say there was a great variety of colouring in the 7 or 8 animals they saw. Some were quite red, unmistakably wild dogs, one was "bilkul kala." After they had broken up the pack by firing these two shots, they said the wild dogs were calling in the jungle in different directions. As they have been with me when I have shot wild dogs and seen and heard me decoy them into the open by imitating their whistling call, I have no doubt about their knowledge of the dogs' call.

I have seen some of the same pack of wild dogs running in the very same spot a few months ago. They invariably drop excreta there; and on this occasion it showed that they had recently killed and eaten a sambhur. The jackal killed was very full, but I did not unfortunately examine the contents of its stomach.

I do not doubt the following facts :—

1. The animal was a member of a pack of which some were wild dogs.
2. It came out to attack the goat with another animal.

It is so long since I have seen a jackal at close quarters that I cannot identify it; but it appears to me to be rather too rufous in places for a jackal and not sufficiently rufous in the general colouring of the body for a wild dog? The mask is too "foxy" for a wild dog. The brush is also too "foxy" along the entire length.

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Therefore I have come to the conclusion that it is either a hybrid or a jackal hunting with wild dogs.

H. W. BERTHON, MAJOR.

AMBOLI, SAWANTWADI,
8th April, 1910.

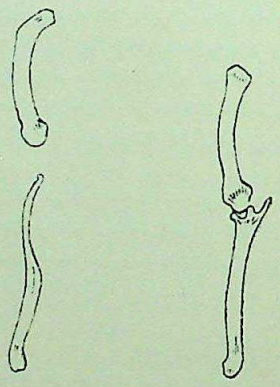
[The skin and skull sent are undoubtedly those of a jackal, the former being rather red on the legs and underside and the latter having seven molar teeth in the lower jaw, whereas in the wild dog there are only six.—EDS.]

No. VI.—THE RUDIMENTARY CLAVICLES OF A PANTHER.

I send herewith a drawing to scale of the rudimentary clavicles I took out of a panther yesterday morning. The panther was 6′-6″ (between uprights), a fully grown male (tail 28½ inches). We could not feel the bones for some time, and when we cut them out thought they were both *broken*.

A—boiled out into 2 separate pieces, the top piece flattish and the bottom piece roundish. No trace of a fracture.

B—also consists of 2 similar pieces, but they are joined by slight gristle which can easily be broken through, and now that it is dry shows that the bones are about 1/10th of an inch apart. But, again, there is no trace of a fracture, the lower bone tapering off into a curving point and the upper one flattish like a very diminutive collar-bone. One emerged from the boiling still joined as shown. These bones do vary in curves and shape, but I have never seen a panther with such absurdly small ones. Even, if we assume that B had been broken, the two pieces are not as big as an ordinary clavicle in an old male panther.



A B

Abnormal rudimentary clavicles.

It would be interesting to know if any one has ever come across similar bones? Have these bones been broken? I have never seen any like them before. The panther was about 4 years old I estimate, from the appearance of the skull.

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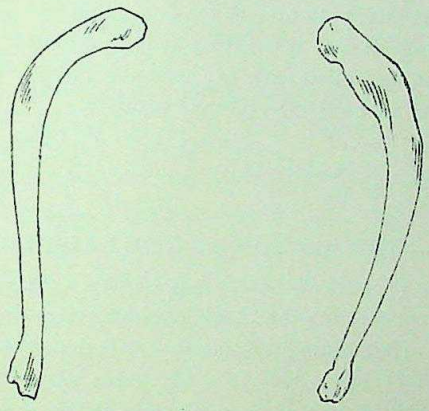
I have taken perfectly formed rudimentary clavicles out of a three-quarters grown panther, 6 feet in length, with hollow eye-teeth.

The teeth of this panther might, from their appearance, have belonged to a very old beast, but the ridge at the back of the skull does not show abnormal growth.

H. W. BERTHON, MAJOR.

AMBOLI, SAWANTWADI,
6th April 1910.

[These collar bones appear to be so different to the usual ones found in panthers that we also figure below a normal pair to show the difference.—EDS.]



Normal rudimentary clavicles of a panther.

No. VII.—SLOTH BEAR CALLING HER YOUNG WHEN ATTACKED.

The following account of an incident which occurred in the hills of Central India the other day (written by a lady) may interest you.

"When stalking over the hills the other morning my husband and I discovered a bear in a very deep valley, and my husband had a long shot at it, on which it leapt up with a "whoof" and charged uphill in the direction of the firing. He fired again, and again it charged in our direction, then the bear commenced calling and making a tremendous din and I said:—"I believe there is a cub," and sure enough we presently heard a little answering call and away down under the trees we saw a small cub. My husband did not shoot again as he felt sorry for the cub. The old bear hesitated for a long time as to what she should do, and then, as the firing had stopped, she decided to return to her little one, and we could hear the gurgle of delight on her return. The cub then jumped up on her back and away they went into the jungle. It was all most interesting."

SECUNDERABAD,
27th March 1910.

W. GAYE.

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No. VIII.—BIRDS FEEDING THEIR YOUNG.

On page 227-228 of his valuable book *Birds of the Plains* Mr. Dewar discusses the possibility of birds storing water in their crops and subsequently bringing it up in order to feed their young. I have a small female Blue-winged Paroquet (*Palaeornis columboides*), which is now about one year old. I have been observing her for the last three weeks and several times have noticed that she brings up her food, chews the same and again swallows it. She especially does this when slightly annoyed. She runs about loose (her wings being cut) and invariably tries to bite anyone who passes her. I have taken great care to see that she has nothing in her mouth. On placing my finger near her, she tries to bite, but owing to the finger nail can do no damage. On these occasions, it is quite easy to see that she has nothing in her mouth. She then makes a beckoning motion with her head and brings up a light yellow substance, very much like a chewed piece of plantain.

G. S. P. PERCIVAL, A. S. P.

MERCARA, COORG, *7th January* 1910.

No. IX.—NIDIFICATION OF THE SARUS CRANE.

In Vol. XIX, No. 2 (p. 524) of the Journal, Captain O'Brien mentions finding a newly hatched sarus chick on the 12th February, remarking that he thought sarus (*Grus antigone*) laid during the monsoon. Is that the case ? I certainly was of the same belief ; but in 1903 I found a sarus sitting on a half-set egg, on strangely enough the same date as Captain O'Brien mentions, the 12th February. This was also in the Mahi Kantha Agency (Mahisa District).

CAMP MALWASAR,
OKHAMANDAL,
KATHIAWAR, 12*th January* 1910.

A. H. MOSSE, CAPTAIN, I. A.

No. X.—THE FOOD OF THE RUFOUS-BACKED SHRIKE (*LANIUS ERYTHRONOTUS*).

Returning one day from shooting in the Bannu District and while driving along the Bannu Dera Ismail Khan Road, which runs through a marshy locality, I observed flying up from a stream by the roadside a Rufous-backed Shrike (*Lanius erythronotus*) with a small fish (*Chilwa*) about 2 inches long in its beak. Whether the fish was taken alive from the stream I cannot say ; but it is probable that it had been so captured by the Shrike in shallow water. It was conveyed by the bird to the telegraph wires near by and there broken up and devoured.

I have never previously heard of a Shrike catching fish and would be glad to know if any of our members have ever noticed this abnormal habit in any of the Shrikes ?

LONDON, 17*th December* 1909.

H. A. F. MAGRATH, MAJOR.

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No. XI.—OCCURRENCE OF THE BRONZE-CAPPED TEAL (*EUNETTA FALCATA*) NEAR ROORKEE.

I am sending you to-day the skin of a duck, which I find some difficulty in identifying and should be extremely obliged if you would give me your opinion on it. Judging from Baker's *Indian Ducks and their Allies* and Hume and Marshall's *Game Birds of India*, it appears to be the female of a Bronze-capped Teal. I shot it on the evening of the 9th instant on some jheels fifteen miles south of Roorkee. It came over me alone, and I at first took it to be a Gadwall, of which the bag with some Mallard chiefly consisted. My boatman told me it was a cross between a Gadwall and a Teal!

E. H. KELLY, LT., R.E.
(1st P. W. O. Sappers and Miners.)

ROORKEE, U.P., 13*th January* 1910.

[The skin proves to be that of a young male Bronze-capped Teal (*Eunetta falcata*). On 3rd March we also received a fully adult ♂ from Capt. Mainprice, also from Roorkee.—EDS.]

No. XII.—WOODCOCK (*SCOLOPAX RUSTICOLA*) IN KANARA.

I send herewith a female Woodcock shot by me on the 17th of December 1909 in the Shivpur Nalla of the Supa Petha of the Kanara District. The country is very hilly all round, the nalla-bed is about 300 feet above sea level, some forty odd miles from the coast line. On each side the valley is shut in by steep slopes to a somewhat extensive plateau above, all covered with grand high forest, much of it pure evergreen 1000′ on the plateau. The country is well watered throughout, the Shivpur Valley especially so, its waters flowing into the Kalanadi river, which drains the whole of the northern part of the District. The temperature of these parts is as low as 46° at this time of the year in the evenings and thereafter heavy mists at night, lasting often up to nine o'clock in the morning.

I had shots at a pair of Woodcock some fifteen years ago on the plateau of Gund above; another settled under my ladder during a tiger-beat about the same place and I came across a fourth on still another occasion. The bird however is exceedingly rarely met with in Kanara.

Colonel Peyton shot one some thirty years ago about the same place, and curiously enough, on the same day that Mr. Laird-MacGregor, then Divisional Forest Officer, Belgaum, accounted for one somewhere in the Ghats of that District.

T. R. BELL,
Conservator of Forests.

KARWAR, 10*th January* 1910.

No. XIII.—OCCURRENCE OF THE EASTERN SOLITARY SNIPE (*G. SOLITARIA*) AT HAKA, CHIN HILLS.

The first day of the New Year found me exploring the nullahs and streams around here for game as my gun had just returned from being overhauled and cleaned.

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From a bend in one of these streams a bird got up and flew slowly and silently away and I managed to secure it. When I shot it I thought it was a Woodcock ; but on picking it up I was struck by its very bright plumage, and came to the conclusion that it might be an immature one. On my return to my house I sat down at once to identify it and found that it was a Solitary Snipe, a species I had not met before.

On the 2nd instant I was out again and "bagged" a Woodcock, a Pintail Snipe (*G. stenura*) and a Partridge (*Bambusicola fytchi*). As the two species of Snipe bear some outward resemblance, the following notes may be of interest to other beginners like the writer. Placed side by side there is no difficulty in recognising the Solitary Snipe by its greater size, by the very much more restricted area of plain white on the under surface, and by the uniform olive brown upper tail coverts, the corresponding feathers of the Pintail being faintly but distinctly barred. *G. solitaria* bears, of course, no real resemblance to the Woodcock with his pale forehead and distinctly marked crown and nape, etc., and it was only the very cursory glance bestowed on it in the field and the abysmal ignorance of a beginner that made such a confusion possible.

The following is a table of a few measurements of the two species of snipe.

	G. solitaria.	*G. stenura.*
Length of bill from gape	2·83 inch	2·4 inch.
Tip of shortest secondary to tip of longest primary	3 „	?
Wing	6·82 „	5·2 „
Total length	12·5 „	10 „
Tarsus	1·37 „	1·3 „
Tail feathers total number	18	24 } variable.
„ „ broad middle ones	8	10 } variable.
„ „ narrow ones on each side ...	5	7 } variable.

As regards other characteristics enumerated in *The Fauna of British India*, I did not find that the white bands on the under-wing coverts and axillaries were broader than the brown ones.

I might add that a printer's error in the Volume referred to has given the Pintail only 2·25 inches of wing.

It appears from Blanford's works that the Eastern Solitary Snipe is rather a rare winter visitant to such southerly latitudes as these, and as I have not seen it reported from this part of the country before, I thought its occurrence here might be worthy of record in our Journal.

F. E. W. VENNING.

HAKA, CHIN HILLS,
4th January 1910.

No. XIV.—DOVES NESTING ON THE GROUND.

With regard to Mr. C. W. Allan's letter on the above subject in Vol. XIX., No. 2 (p. 523) of our Journal, he may be interested to know that I found,

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some years ago at Chorwar in Kathiawar, the nest of *Turtur cambayensis* (The Little Brown Dove) placed on the ground, on a large bare plot surrounded by the ordinary Indian Cactus. The nest contained two young birds. Besides the almost impenetrable jungle of Cactus round the spot, there were only a very few low bushes and stunted trees in its near vicinity. It is difficult to imagine how the old birds had succeeded in rearing their offspring as far as they had done, considering what timid birds they are in the face of danger and without any of the habits universally possessed by birds which always lay their eggs on the ground.

L. L. FENTON, LT.-COL.

SOUTH MOLTON, NORTH DEVON, ENGLAND.
10th January 1910.

No. XV.—OCCURRENCE OF THE LESSER FLAMINGO (*PHŒNICONAIAS MINOR*) IN KATHIAWAR.

Stuart Baker in his *Indian Ducks and their Allies*, remarks in respect of the above bird that we have no record of its occurrence in Cutch or in Kathiawar, it is therefore perhaps worthy of record that when serving in the last-named Province, some few years ago, I both saw and shot the bird in the Porbandar State. They were not plentiful. I had no difficulty in identifying the only bird I shot in mistake for the larger kind.

L. L. FENTON, LT.-COL

SOUTH MOLTON, NORTH DEVON, ENGLAND.
8th January 1910.

No. XVI.—BREEDING OF THE GREAT STONE-PLOVER (*ESACUS RECURVIROSTRIS.*)

While out snipe shooting in the bushes along the banks of the Kistna River, in Kurnool District, on 29th June 1909, my dogs killed a young *Esacus recurvirostris*. It was a week or 10 days old, as the wing feathers were lurking through the quills. According to Oates their breeding is from March to June, and according to Finn from February to May. There was no mistaking the young bird and there were at least 12 old birds flying about in the neighbourhood.

H. R. S. HASTED.

MORAVAHONDA, *29th January* 1910.

No. XVII.—TWO BIRDS' NESTS FROM TIBET.

1. THE RED-NECKED MOUNTAIN FINCH. (*Montifringilla ruficollis*—Blanf). This bird nests in the disused hole of the Mouse-hare (*Lagomys*). I have only obtained one nest, which was made about one foot below the surface of

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the ground at the end of a tunnel about four feet long from the entrance. This nest was very roughly made of roots and grass and was lined with feathers, wool and the fur of the Mouse-hare. The nest contained four white eggs which measure 21×15, 21×15, 19×12mm.

This clutch has been given to the Society. These eggs were taken at Phari-Tibet on the 8th June 1908, at an altitude of 14,300 feet. The bird was common, and I saw several pairs making their nests. I also obtained several nests of *M. adamsi*, which nests in the same place and in the same manner; indeed, the nest and eggs of these two birds are indistinguishable, except that the eggs of *M. adamsi* are slightly larger.

2. Robin Accentor. (*Accentor rubeculoides*—Hodgs.)

I took a nest of this Accentor near Dochen in Tibet at an altitude of about 15,500 feet on the 2nd July 1908. The nest was neatly constructed of moss lined with hair and wool, and was placed under a tuft of rushes in the bank of a stream overhanging the water. It contained four blue eggs from 20·2 to 21·2 millimetres in length by 15mm. in breadth. The bird is common in that part of Tibet, and I had previously found a nest near Phari under a bush of dwarf rhododendron at a height of 14,500 feet above sea level.

Edinburgh, *January* 1910. F. M. BAILEY, Capt.

No. XVIII.—BIRD NOTES FROM A HOMEWARD BOUND STEAMER IN NOVEMBER.

Before slipping our moorings in Bombay Harbour on one of those pleasant afternoons, when having just obtained leave one looks at India over the stern, I noticed among the flocks of Laughing Gulls (*Larus ridibundus*) flying around, a very small gull which may possibly have been the Little Gull (*L. minutus*) ?

About 350 miles out a small bird either pipit, bunting or lark, much to my astonishment, appeared flying round the ship. What could have induced this lonely waif to traverse such a vast waste of waters? There could have been no question of the unfortunate bird having been blown out to sea by storms for the weather was fine and calm, as it usually is at this season. Nor were we on, what might in any sense be called, a migration route. Reflection in such circumstances reveals the tragic nature of these occasional, erratic, straying flights of small land birds, but leads one to speculate in vain regarding the origin of an impulse which so remorselessly misleads and drives its feathered victims to their doom.

The 3rd day out, I saw some white Tropic-Birds probably *Phaëthon flavirostris*.

At Aden the Sooty Gull (*L. hemprichi*) was most abundant in the harbour. There were also a few *L. ridibundus* among which were probably The Brown-Headed Gull (*L. brunneicephalus*). It needs a practised eye to detect the differences between the two last species in winter plumage.

In the southern end of the Red Sea, the Booby (*Sula leucogaster*) was particularly numerous. It was interesting to see these gannets beating up

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from their feeding grounds at sea to roosting quarters on the numerous rocky islets, that stud this stretch, in the teeth of a stiff breeze and over a choppy sea. The formation was invariably in single file, each bird about a length in rear of and in echelon to the lee of the preceding one. The flight was maintained a few points off, not directly into the winds' "eye" and just above the water, the troughs and crests of the waves being followed so as to obtain the shelter afforded by the retarded air currents near the surface.

The distant spectacle of these long strings of brown objects rapidly moving across and appearing and disappearing above and below the surface of the sea made it easy to imagine how in former and less sophisticated seafaring times the wonderful mariners' yarns of "Monstrous sea serpents careering o'er the Deep" arose.

Speculation regarding the significance of the echelon formation above referred to raises some interesting questions on bird aviation. Why should this flight formation be usual in flocks of some species and not in others, and how are the former (as they evidently are or the formation would not be employed) aided in their flight by such formation ?

A little consideration will call to mind those species in flocks of which it is in vogue, *e.g.*, the Cranes, Storks, Geese, Ducks, certain Waders and sea-birds etc. Also flocks in which it is not seen or is not noticeable such as those of the smaller passerine species, the Gulls, Rooks and Lapwings, and in coveys of partridges or packs of grouse, etc. If we bear in mind how species in both of the above categories fly in flocks the suggestion will occur that the formation in question is intimately connected with uniformity and compactness of flocks, with weight and size of the component individuals, with velocity with the powers of sustained flight required by migrant species and with capacity, in spite of size, for making headway in adverse winds. Conversely that it confers no advantage on flocks in which the individuals do not fly in very close proximity to each other, in which the formation is a loose and straggling one, in which the individuals, although fast fliers, have little power of sustained flight, and in those composed of birds whose small size offers comparatively little resistance to the air.

The answer to the first half of the question must then, I think, lie in the characteristics of the different species of gregarious birds and the necessities of their existence.

To the second half the answer must, I think, be sought for in the behaviour of the atmosphere on the passage at speed of a heavy body through it. A large or heavy bird in rapid flight in a still or slowly moving atmosphere must continually displace a volume of air equal to its bulk and thus be the cause of a powerful indraught in its immediate rear, Behind the same bird flying against a high wind if there is no indraught there is yet a certain space in which the air is comparatively still. In the former case a bird immediately behind would be in a strong following wind, a state of things birds dislike intensely as it upsets their equilibrium. In the latter the bird would be to

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some extent in still air necessitating a difference in effort of wing stroke. In both cases this would quickly lead to disintegration of the flock, accurate keeping of station and equality of speed becoming impossible.

It is probably the case therefore that the echelon formation renders important aid to large birds in keeping the flocks intact when on the wing by enabling the individuals composing the same, while keeping close to each other, to avoid the air disturbances set up by those immediately in front, at the same time ensuring to each a uniform air pressure and outlook to the front.

The V formation commonly and the Y occasionally seen must necessarily result from the echelon when the rigidity of the flock lines becomes relaxed.

Half-way up the Red Sea I noticed a falcon (not identified) flying close to the ship.

At Suez there were a few cormorants (*Phalacrocorax carbo*) perched on the buoys in harbour, numbers of *L. ridibundus* possibly among them, the Adriatic Gull (*L. melanocephalus*) and a few *L. hemprichi*. Just before we dropped anchor a single Booby (*S. leucogaster*) flew across our bows and shortly after a flock of Sandgrouse, species undetermined, was observed crossing from the African to the Asiatic Shore. Steaming slowly into the Canal the mudflats behind Suez came into view covered with flocks of waders bunched together to face the cold north-east wind blowing off the desert and out of a leaden sky. Chiefly consisting of Curlew, Whimbrel and Oyster catchers there was one flock of 15 or 20 Spoonbill (*Platalea leucerodia*) which showed up a vivid patch of white against the dark grey background. Here and there a solitary Heron (*Ardea cinerea*) stood patiently fishing in the shallows.—Indian waters were left behind !

H. A. F. MAGRATH, MAJOR.

December 1909.

No. XIX.—THE SMEW (*MERGUS ALBELLUS.*)

Mr. E. C. Stuart Baker in his book *Indian Ducks and their Allies* writes regarding the Smew (*Mergus albellus*) that "there seems to be no record of single birds or pairs being obtained."

While shooting on the River Indus on the 22nd February 1910, I was walking up the bank of a tributary, a stream some 50 yards wide, when I saw two birds in the water some distance ahead of me. Hiding myself, I sent the Shikari round to drive them past me, and succeeded in getting one which proved to be a male Smew in fine condition. The other I failed to get, as it gave me a wide berth the next time this ruse was tried.

Perhaps this might prove useful as a record of a pair of Smews having been seen.

R. FRANCIS, LIEUT.,
47th Sikhs.

DERA ISMAIL KHAN,
N. W. F. PROVINCE,
27th February 1910.

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No. XX.—ROLLER CATCHING ITS PREY IN THE WATER.

On the 14th September, I saw from my window a Burmese Roller (*Coracias affinis*) fly from his perch on the top of a bush, and dive head-first into a tank, king-fisher fashion, and emerge immediately afterwards, returning to his perch on the same bush, where he swallowed whatever it was that he had caught. I was very surprised, as I have never seen or heard of a Roller behaving in this manner. I got my field glasses and watched the bird very carefully. He was only 120 yards away, and I saw him repeat the operation four times altogether and each time he returned to the top of the same bush. Though I looked very carefully, I was not able to see what it was that he caught, although I could see quite plainly that he plunged bodily into the water, and was momentarily submerged. After each dive he returned to his perch on the bush on the bank above the tank and he swallowed his prey quickly, also shaking his feathers very vigorously several times to dry his plumage.

The bush he sallied from, and returned to, was about 4 feet high, and growing on a bank about 10 yards from, and 8 or 10 feet above, the tank.

The tank is full of fish, but I hardly think it could have been for fish he was diving. I thought at the time it must have been some water insect which he was after, but unfortunately, even with my glasses, I could not make out what it was. I would have attempted to get closer to the bird to see what he was catching, but unluckily a native came along with some mules and the Roller flew right away behind the Fort.

Some days later one of my servants, who had also observed the bird at the time when I saw it first, told me he saw the bird, probably the same one I think, behaving in a similar manner at the same place, while I was out.

On the following day I saw a Roller fly up and settle in a tree about 20 yards in front of my bungalow in the corner of the compound. He had something in his bill which he was evidently trying to swallow. I quickly got a pair of field-glasses and was in time to see that what the bird was trying to swallow was a frog, but unfortunately I did not actually see him swallow it, because a man passing close to him disturbed him, and he flew on to another tree further away, and there I think swallowed it ; but he was too far off for me to see properly.

There are two of these birds, *Coracias affinis*, always about near the tank which is outside the Fort wall, but is overlooked by my upper rooms. I now watch them with my glasses, whenever I get an opportunity ; but I have not again seen either of them diving into the water.

I believe the two birds are always the same. One of them I have noticed when looking at him through my field glasses is a beautiful specimen, I think this is probably a cock and the other a hen bird. I do not think a Roller could catch a fish, but it is possible that he is catching various prey when he dives—sometimes a frog, at others a water-beetle or larva, etc., etc.

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It was very pretty to see the bird emerge from the water after diving. The great blue wings, seen through the glasses, looked beautiful, with drops of water rolling off them and sparkling in the light.

The above is, I consider, a most interesting case. I personally am of opinion that individual birds of whatever species are full of character and individual peculiarities just as much as human beings are. If one is able to observe birds in their wild life, acting naturally as they do when they either do not know they are observed or have no fear of the observer, one sees what very highly intelligent beings they are, how versatile are their moods and how much individual specimens of the same species can and do vary, and I also think they develop habits just as human beings do.

It is quite possible that very few Rollers develop this habit of diving into water which I observed, and probably this bird was an individual of a bolder nature than the usual run of this species, and was willing to take the risk of a plunge to obtain some prey in the water which had taken his fancy.

Since my notes were first written, I have been in correspondence with Major Harington on this subject. He informs me that he has never observed a Roller diving, but that he does not see any reason why they should not, as they are related to the king-fishers, which habitually dive; and some king-fishers, notably *Halcyon smyrnensis*, the common White-breasted Blue King-fisher, feeds very similarly to the Roller.

H. DELMÉ RADCLIFFE, MAJOR,

BHAMO, *8th November* 1909. R. W. F.

No. XXI.—SHRIKES' LARDERS.

Last year in January, when out riding in the early morning, I saw a Grey Shrike (*Lanius lahtora*) fly into a babul tree with some thing in its beak. On going over to investigate, the bird flew out and perched in a neighbouring bush. He had nothing in his bill when he flew out. On searching about, I found his larder in the tree; it was near the top about twelve feet from the ground. In it were four or five locusts neatly impaled on thorns. What I had seen him fly in with was evidently one of these which he managed to impale in the short time, while I was approaching the tree or perhaps had dropped when I frightened him away; but if so I did not see any sign of it on the ground. The larder could be easily seen from the ground and could have been at once found by a crow alighting in the tree which was quite a small one. The tree was one of two or three in a quite open maidan.

While I was examining the larder, the Shrike sat in a neighbouring bush and as I rode away I saw it fly back again into the tree. Unfortunately, I had not an opportunity of visiting the place again for some time, but when I did there was no sign of the larder.

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I remember to have seen a larder some years ago in a small babul bush, but I have forgotten the details, but I remember the owner was not visible.

J. R. J. TYRRELL, CAPT., I. M. S.

SIRDARPORE, BHOPAWAR AGENCY, C. I.,
16*th April* 1910.

No. XXII.—OCCURRENCE OF THE LESSER FLORICAN OR LIKH (*SYPHEOTIS AURITA*) OUT OF SEASON.

On two occasions last week while motoring near here I flushed a Lesser Florican from off the side of the road. On both occasions the bird got up about the same place, so it may have been the same bird.

On the 13th instant while out riding in quite the opposite direction I again put up a florican. They all looked like females but may have been males in winter plumage. A good many florican come here during the rains, but I have not heard of them being seen so late as April. There is a good deal of long grass all about and water in several nallas.

J. R. J. TYRRELL, CAPT., I.M.S.

SIRDARPORE, BHOPAWAR AGENCY, C. I.
15*th April* 1910.

No. XXIII.—SHRIKES' LARDERS.

Shrikes' larders in India, concerning which there would appear to be some scepticism, I for one can vouch for. Incidentally in my wanderings I have come across at least three of the Rufous-backed Shrike (*Lanius erythronotus*). One such was in the Vale of Kashmir, the meat being a fat black cricket impaled on a thorn within 10 yards of a nest of this Shrike.

Two others were in Bannu, the meat in one case being either a wasp or a cricket (I cannot now quite recollect which) impaled in a rose bush. In the other a small piece of what looked like dirty butchers' meat impaled on one of the sharp pointed leaves of a small date palm just outside the walls of the City. The Shrikes were seen flying up from the bushes in the case of the last two. In addition I have a note dated January 10th of a larder of The Grey Shrike (*L. lahtora*) which I discovered in a thorn bush in a desert track in Bannu. It was stocked with a large locust and a species of striped moth.

These larders were situated in dense and prickly bushes and were quite safe from crows. I have no observation to show that the contents of any suffered especially from ants or other insects or what subsequently became of them.

While on this subject I may mention that last hot weather in my garden in Bannu a Rufous-backed Shrike rifled a nest full of young Purple Sunbirds (*Arecnecthra asiatica*). As the Shrike could hardly have devoured all the young

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at a sitting, I have little doubt that a search in the surrounding bushes would have disclosed his larder well stocked with the remains of the young sunbirds.

H. A. F. MAGRATH, MAJOR.

CARRON-STRATHSPEY, SCOTLAND,
26th April 1910.

No. XXIV.—A SNAKE FLIRTATION.

Your correspondent's note under the above heading in the last Journal, sounds as if this were a matter of very rare occurrence. But is this so? I have on various occasions come across snakes so entwined, and have looked upon it as usual, if perhaps somewhat seldom actually witnessed, and I find in my notes that on two occasions last June, I saw the same thing with the same snakes as mentioned by Mr. Millett *viz. Zamenis mucosus*, and have entered it merely as an occurrence of coming upon snakes "in cop"—to use a term common among lepidopterists.

Both these occasions were in the foot hills of the western slopes of the Nalamalais in Kurnool District. On June 10th I heard a struggling noise just off the path, and found two very large Dhamans entwined and throwing themselves about—whether struggling or not I could not see. On my approach they immediately separated and went different ways, one into an adjacent old ant hill. One of those must have been nearly 9 feet long.

The other occasions noted in same locality, and only about a mile from same spot, was on June 23rd when I again came upon a very large pair of these snakes in the same position. This time both were quiet, with heads and free parts of body slightly off the ground, facing each other. Again I was unable to make any close observation as unlike the case reported by Mr. Millett, they again immediately uncoupled and went their ways. I tried to catch one, to examine the parts, but though I got hold of the tail, he or she, turned and savagely bit my hand and forearm and got away.

CAMP BOYIRANI, GANJAM DT.
2nd January 1910.

COLERIDGE BEADON.

No. XXV.—THE FOOD OF CROCODILES.

Can any of your readers inform me whether it is usual to find stones inside the belly of a crocodile?

On the 30th December last I shot a 16 feet male Gharial (*Gavialis gangeticus*) on an island in the Sarda River near Chuka Dhya, Pilibhit. I found inside it a quantity of round stones such as are found in the river bed. I estimate there were about ten pounds weight in all. I kept three of the largest which weigh about eight ounces each.

There was nothing else in the animal's stomach except the remains of a bird and some weed. Natives who were with me suggested that the crocodile had swallowed the stones because he was hungry and could get nothing else. Is

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this the explanation, or does a crocodile require stones to aid its digestion in the same way that birds require sand ?

HARDWAR, U. P.,
9th January 1910.

H. W. FORSYTH, CAPTAIN, R. E.

No. XXVI.—REMARKS ON THE VARIETIES AND DISTRIBUTION OF THE COMMON GREEN WHIPSNAKE (*DRYOPHIS MYCTERIZANS*).

Since my article on the green whipsnake (*Dryophis mycterizans*) appeared in the Popular Treatise Series in this Journal (Vol. XVI, p. 542), further allusions to this snake have appeared from time to time in literature which I think deserve collation.

No less than five varieties may be recognised, four of these being colour varieties.

Variety *typica*. This is the common form. It is dorsally of a uniform leaf-green colour, and ventrally between the lateral white or yellow stripes which run down the whole belly length on to the tail, it is green of a lighter shade and peculiarly brilliant hue.

Variety *lepidorostralis*. Dr. Annandale (Mem. Asiatic, Soc. Bengal., Vol. 1. No. 10, p. 196) alludes to a new variety which differs from *typica* in having the nasal appendage covered with small scales, such as occur in the species *pulverulentus*, only that they are larger (in this variety of *mycterizans*). That this is not a colour variety of *pulverulentus*, he states, is shown by the nasal appendage being shorter than the diameter of the eye. This variety appears to be peculiar to Bengal. The Superintendent in the Zoological Gardens, Calcutta, told Dr. Annandale that he frequently noticed this peculiarity among specimens from Midnapore. I saw such a specimen in the Zoo in Calcutta last time I visited it, and was allowed to remove it and inspect it closely. I have never seen such a specimen from any other part of our Indian Dominions. It is coloured exactly like *typica*. It is such a distinct variety that I suggest the name *lepidorostralis* for it.

Variety *zephrogaster*. This differs from *typica* in that the belly between the lateral ventral stripes is of a cinereous grey. The first allusion to such a specimen is that reported upon and figured by Dr. Russell in 1796 (Ind. Serp., Plate XIII).

I had a similar specimen brought to me in Trichinopoly in March 1896. Later I alluded in this Journal (Vol. XVIII, p. 783) to three specimens which I believed came from Burma, but which might possibly have been received with a collection from Ceylon. I am more than ever convinced that these specimens came from Burma because since then I have twice heard from Colonel G. H. Evans of similar specimens. In March 1908 he wrote of two such specimens that he had captured alive and examined, and in December of the same year told me he had acquired two others. All of these he had

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encountered in burnt Kaing grass. In Russell's specimen the ventrals and subcaudals were 174+148, in my Trichinopoly example they were 179 +138, and in three Burmese specimens they were 176+146 ?, 176+153, and 181+151.

Variety *rhodogaster*. In Vol. XVIII., p. 919 of this Journal I mentioned a new colour variety received by our Society from Shwebo, Upper Burma, which differed from *typica* in that the belly between the ventral lateral stripes was rose-pink. Since this I have received a similar specimen from Mr. W. A. Jacob, I.F.S., from Jalpaiguri, only that the colour on the belly in this case is a pinkish-buff. In the Shwebo example, the ventrals and subcaudals were 191+140 ? (tail broken), in the Jalpaiguri specimen which was a ♀ 201+148.

Variety *isabellinus*. This variety is uniformly buff or khaki colour above, and a similar colour only of a lighter shade on the belly between the two lateral stripes. Like the other varieties it appears to be rare. Boulenger (Catalogue 1896, Vol. III, p. 181) mentions it without specifying from where he had received it. I obtained a ♀ specimen from Paralai, near Valparai, Anamallay Hills, last year, the only one I have ever seen. It was one of four, the rest being of the typical variety. The ventrals and subcaudals were 168+136. These same shields in the other specimens were ♂ 173+154, ♀ 179+?, and ♀ ? 169+140. I suggest for this the name *isabellinus*. The species as a whole is distributed as follows.

It does not occur in the Indus Basin, nor seemingly in the Ganges Basin West of Purneah. (The solitary specimen recorded from Purneah which is in the Indian Museum was purchased, and may have been introduced, as Indian jugglers very frequently carry this snake about in their stock in trade). South of the Ganges Basin it is more or less common, but especially so in Southern India and Ceylon. On the Western side of Peninsular India it has been obtained as far North as Mount Abu (Sclater. The specimen is in the Indian Museum). On the East, Blanford (Jourl. Asiat. Society, Bengal, Vol. XXXIX, p. 373) reported it common in Orissa and Bengal, and it would appear to be so towards the Gangetic Delta, judging from specimens in the Indian Museum. A specimen in the British Museum is recorded doubtfully from Assam. In the Irrawaddy—Salween Basins—it is not a very uncommon snake, and has been recorded as far North as Bhamo (Anderson, Ann. Zool. Res Yunnan, p. 826). Further East it occurs as far as Indo-China, but is not found anywhere in the Malayan Peninsula or Archipelago.

F. WALL, C.M.Z.S.,
MAJOR, I.M.S.

CHITRAL, *9th February* 1910.

No. XXVII.—NOTE ON THE BREEDING OF *ECHIS CARINATA*.

In his article on *Echis carinata*, Major Wall tells us (Society's Journal, Vol. XVIII, p. 537) that the records of the breeding of this snake are very meagre.

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It may therefore be of interest to put on record the laying of 8 eggs by an *Echis carinata* kept in captivity in the Bombay Bacteriological Laboratory. The eggs were laid on the 8th of July 1909, and all appeared to be infertile. They measured 13 millimetres ($\frac{9}{16}$ of an inch) in length by 10 millimetres ($\frac{2}{5}$ of an inch) in breadth, after having been kept for a couple of months in formaline solution. The eggs are reported to have been covered with slime and to have been yellowish white in colour. There were six phoorsas in the cage, the latest arrival having been received on the 10th of February, that is six months previously.

The seasons in which young are noted as having been found by the authorities quoted in Major Wall's paper, are April, May and June for Ratnagiri, July for London, August for Trichinopoly, Multan and Quetta. Now we have one additional record of July for Bombay.

W. B. BANNERMAN, M.D., D. Sc.,
LT.-COLONEL, I.M.S.,
Director, Bombay Bact. Laboratory.

PAREL, BOMBAY, 17*th February* 1910.

No. XXVIII.—NOTES ON THE VIVIPAROUS HABIT OF JERDON'S PIT VIPER (*LACHESIS JERDONI*) AND OBSERVATIONS ON THE FŒTAL TOOTH IN THE UNBORN EMBRYO.

Amongst other snakes recently received from Mr. F. E. W. Venning collected in Haka, Chin Hills, Upper Burma (6,500 feet) is a gravid specimen of Jerdon's pit viper which is of exceptional interest.

I believe I am correct in saying that hitherto we have had no certain evidence to show whether this snake is viviparous or oviparous, but the point is settled now for I found six membraneous sacs containing embryos in an advanced stage of development "in abdomina parentis." The sacs measured about one and a half inches in length, and one inch in breadth, two being developed in one oviduct, and four in the other. The contained embryos in every case occupied the upper half, that is the vertebral half, where they were plainly visible through the transparent investing membrane. The lower half of each sac contained yolk.

I extracted the embryos, and found there were two males and four females, two of the latter being in each oviduct. In the males the genitals were extruded, as I have found them in all other snake embryos, and the retraction of these organs into the sheaths at the base of the tail where they lie invaginated in all snakes after post-oval, or post abdominal life, must occur at a late stage of intra-maternal life judging from these fœtus. Each ♂ clasper was observed to be bifid as I have noted in other vipers.

By far the most interesting observation brought to light is the fact that the embryo developes a special tooth-like organ to enable it to liberate itself from its investing membranes, just as the embryos of an oviparous parent are pro-

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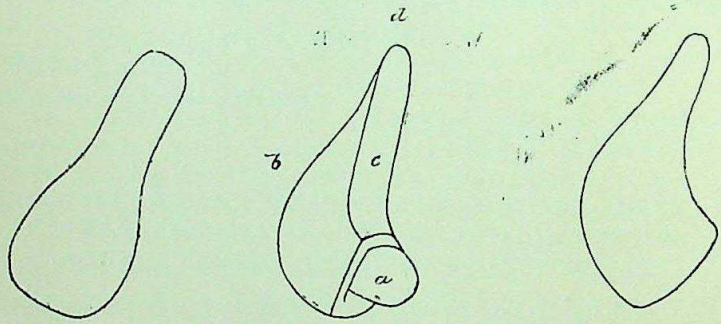
vided with a cutting instrument to incise the egg-shell and release themselves from their ovicular imprisonment. As far as I am aware this is an observation new to science.

One might have supposed that a very moderate pressure from the snout of a vigorous embryo would suffice to rupture membranes which appear so delicate, but this is evidently not the case.

I was able after some trouble arising from the minute proportions of this structure—which when removed is only just visible as a speck to the naked eye—to view it under the microscope, and it will be seen from the accompanying figures that in conformation it is very different from the analogous organ of an oviparous embryo, some remarks upon which and a figure were published in this Journal some time back *.



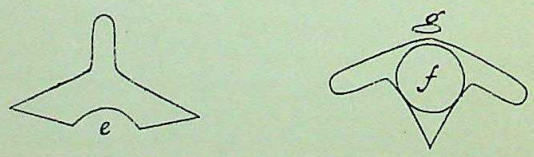
Fœtal tooth of Lachesis jerdoni.
(much enlarged).

A. INFERIOR SURFACE.

B. SUPERIOR SURFACE :—

(*a*) root ; (*b*) inferior surface ; (*c*) flattened superior surface of bill ; (*d*) cutting anterior edge.

C. SEEN IN PROFILE.



D. PRÆMAXILLA of fœtus of *Lachesis jerdoni* seen from front, showing arch (*e*) beneath which the bill (*d* in fig. B) projects.

E. PRÆMAXILLA seen from below showing the socket (*f*) into which the root of the fœtal tooth (*a* in fig. B) fits. (*g*) shows anterior surface.

* Vol. XVIII, p. 504.

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As in an oviparous embryo, the organ is embedded in the præmaxilla, its dome-like root (*see a* in figure B) being received into a socket in the lower aspect of that bone (*see* figure E). The whole structure is extremely like a duck's head in shape. Its rounded aspect (*b* in figure B) is the lower, and its flattened aspect the upper (*see c* in figure B). Its bill-like extremity ending in a rounded, horizontal incising edge (*see d* in figure B) projects forward beneath the præmaxillary arch (*e* in figure D). The root is yellow in colour, and all the rest of the structure white. Figure A shows the lower surface and C a profile seen from below and in front.

The measurements of the brood and the ventrals and subcaudals are given below, and it will be seen that they do not show any sexual differences.

Sex.	Length.	Ventrals.	Subcaudals	Ventrals between navel and anal.	Costals.		
					Two heads-lengths between head.	Midbody.	Two heads-lengths before anus.
♂	7½	174	59 ?	17	21	21	17
♂	7⅞	174	56 ?	20	21	21	17
♀	7⅝	172	56 ?	15	21	21	17
♀	7¾	173	60 ?	15	21	21	17
♀	7⅞	175	54 ?	13	21	21	17
♀	7⅞	174	57 ?	13	21	21	17

The parent was killed on the banks of a nullah on the 1st of August 1909. She measured 2 feet 5 inches, of which the tail accounted for 4¾ inches. The costals were the same as those of her brood *viz.* 21—21—17, and the reduction of rows from 21 to 19, and 19 to 17 occurred very close together, and in both steps was due to a fusion of the 5th and 6th rows above the ventrals. The ventrals numbered 175, and the subcaudals 52.

Another interesting point brought to light is that in this species there are no palatine teeth, unlike other species of the same genus of which I have skulls (*anamallensis, monticola, gramineus, macrolepis, purpureomaculatus* and *trigonociphalus.*) The dentition is as follows :—*Maxillary* 2 large fangs placed side by side. *Palatine* none. *Pterygoid* 5 to 6. *Mandibular* 10.

Another specimen measuring 10⅛ inches from the same source killed on the 26th August 1909 is obviously this year's production and indicates that the embryos in the gravid ♀ would probably have grown an inch, or two more before being born. These dates of capture serve to fill in another gap in the breeding history of this species, *viz.*, the season when the young are pro-

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duced. The costals in the hatchling were similar in number to those of the and her brood. The ventrals 170 and subcaudals 60.

F. WALL, C.M.Z.S.,
CHITRAL, 1*st March* 1910. MAJOR, I.M.S.

No. XXIX.—LARGE MAHSEER.

In *The Field* for November 13th, 1909, Mr. C. E. Murray-Aynsley gives an account of the capture on September 20th of a large (Mahseer *Barbus tor*) in the Cauvery river which he eventually landed after an exciting fight lasting over half an hour. The fish weighed 103 lbs. and measured as follows :— length, 64 inches ; girth, 39 inches ; mouth across, 8½ inches ; tail across, 19 inches. This is the second large Mahseer Mr. Murray-Aynsley has been fortunate enough to catch and in *The Field* for November 10th, 1906, he gave an account of how he caught the first one.

The weight of the fish caught then was 104 lbs. and it measured : length, 66 inches ; girth, 37 inches ; mouth, 8½ inches ; tail, 19 inches.

There are not many records of the weight of large Mahseer which can be relied on. Thomas in The *Rod in India* says :—" We hear of captures of fish weighing more or less about 100 lbs." and he goes on to give extract from a letter from G. P. Sanderson, with reference to the weight of a large Mahseer the latter had caught on a night line but was unable to weigh. He (Sanderson), however, estimated it at 150 lbs., though it only measured "length including tail 60 inches ; greatest girth 38 inches ; inside lips when open circumference 24 inches," but he adds :—" Of course my rough estimate of the fish's weight is valueless as fact, but you may believe that I was not out many pounds. It was an astonishingly thick and heavy fish for its short length. I have caught them 5 feet 6 inches, but not much more than 80 lbs. It had a shoulder like a bullock, steeply hanging over. I have caught about fifty of them, but my next largest was about 90 lbs. I have no doubt in my own mind that they run over 200 or 250 lbs. as I have seen teeth and bones of them far larger than my 150 pounder ; they are often caught by the natives."

Dr. Day records a Mahseer caught in the Poonch river near Jhelum which measured " from snout to bifurcation of tail 3 feet 11 inches and weighed 62 lbs." Writing in the *Anglers Handbook* the late Captain G. H. Lacy and Surgeon-Major Crelin say :—" It runs to 200 lbs. and 5½ feet." Sanderson in his *Thirteen years amongst the Wild Beasts of India* describes and figures a monster Mahseer caught with a night line in the Cauvery river. " I saw a similar Mahseer caught with a net in the Gogra at Fyzabad. The length of each of these fish was about equal to the height of a man 5 feet 6 inches. Sanderson underestimates his at 150 lbs., the other was estimated at 100 seers. The late Captain Lacy caught a female Mahseer at Taugrot 61 lbs. in weight, 4 feet 7 inches in length and 2½ feet. in girth."

" Skene Dhu " in his recent work *The Angler in Northern India* (1910) says the Mahseer " runs to 200 lbs. in weight " and adds that " the largest Mahseer

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caught to date fairly on rod and line was caught within the last two years by Mr. Murray-Aynsley, . . . if I remember rightly, 104 lbs." In the Society's room there are the remains of two large Mahseer captured in the Bowani river (S. India) by the late N. S. Symons weighing 71½ and 65½ lbs. respectively

From the above it will be seen that there are no actual records of a Mahseer weighing over 104 lbs., which have been properly weighed. There is no value in the statement that Mahseer weighs up to 200 lbs., unless evidence can be produced of a fish of that size which has been actually weighed. Our Society will always be glad to hear of the size and weight of any large Mahseer or indeed any sporting fish caught by members or their friends.

N. B. KINNEAR,
(Keeper of the Museum.)

BOMBAY NATURAL HISTORY SOCIETY,
BOMBAY, *April* 1910.

No. XXX.—ENTOMOLOGICAL NOTES.

(EDITED BY H. MAXWELL—LEFROY.)

(*a*).—WHAT IS A CUCKOO-SPIT?

One commonly finds upon grass or herbaceous plants, a white mass of frothy liquid which usually contains a flattened white insect. This froth is the production of the insect itself, presumably a protection from enemies and is formed only during the immature stages, the mature winged insect being extremely active. The insect is one of the Aphrophorine division of the *Cercopidæ*, our common species belonging to the genera *Poophilus*, *Ptyelus* *Clovia* and *Aphrophora*. A good deal has been written about the formation of the Cuckoo-spit, the latest being Guilbeau's paper (Amer. Naturalist, XLII, p. 783) wherein the author reviews previous work and adds observations of his own. The frothy mass of bubbles is composed of liquid and excretion which on being extruded runs to the lower side of the abdomen where it is mixed by the hind pair (or two pairs) of legs with a secretion derived from glands in the skin of the 7th and 8th segments of the abdomen. This secretion is to make the anal excretion gummy and the action of the legs is to mix it well. This being done, the insect makes a bubble by protruding the end of the abdomen beyond the liquid, opens up the pair of lateral appendages on the abdominal segment and draws in air, making a bubble. By continually making bubbles the insect keeps itself covered with the frothy mass. Like all of the family, these insects feed on plant sap, absorbing the nutriment and excreting large quantities of liquid.

(*b*).—IDIOCERUS AND ITS BROODS.

Leafhoppers of the family *Jassidæ* are not generally familiar, except in the form of those which come abundantly to light and those which swarm on the mango-trees in March, covering the leaves with sticky gum and blighting the blossom. The latter are species of *Idiocerus* and usually breed in March when the mango puts out green shoots, providing soft tissues for egg-laying and abundant sap for food. During the rest of the year, the *Idiocerus* waits,

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growing less in number till the next season, and in five years' observation of this genus, we have never seen breeding at any time but March. This season has been an exceptionally wet one and the mango trees shot out freely in September. Whether from this reason or not, the *Idiocerus* also bred and one distinct brood was produced at a season when we have never before observed it breed at all. One hesitates to put this down definitely to any cause except that the very curious breeding times of this insect are accounted for in no other way but by saying that the growth of new shoots in March actually does provide a tissue soft enough for egg-laying and also abundance of sap as food for both young and adults. One would imagine that a tree such as the mango provided abundant sap all the year round but it evidently does not.

(*c*).—THE EGGS OF TETTIGONIELLA.

Tettigoniella spectra is a very common white Jassid found upon rice and grass; like most of our obscurer insects it has been very little investigated and only its bare occurrence noted. Its eggs were recently found, laid side by side in the tissues of the leaves of the rice plant, the usual cigar-shaped eggs found in this family. Those found here were submerged and were kept in water to hatch. They hatched but while a few yielded nymphs, most yielded a tiny winged Proctotrypid parasite which was perfectly at home under water, walking about and evidently accustomed to going under water in search of eggs in which to oviposit. In the present state of entomology it is impossible to identify *Proctotrypidæ*, which are extremely abundant in India. Other aquatic Proctotrypids are known, predaceous on aquatic insects, notably *Prestwichia*, parasitic upon the eggs of Caddis flies in water and *Polynemia* in the eggs of a dragonfly.

(*d*).—WHAT DO DRAGONFLIES EAT?

Practically all day long there are dragonflies on the wing, hawking in the air and, presumably, getting something for their trouble. At times the air is full of them, as it were, and seeing them against the setting sun, one sees simply a multitude of shining forms, darting here and there in incessant activity. They congregate in spots, not always the same but varying from day to day, perhaps as food is to be found and as the insects they prey on are to be found here and there.

During the last month (November) there have been abundant May-flies, of the genus *Chlœon*, dancing up and down in the still air as the sun rises; each one goes steadily up, then goes down straight in a rush and then up again with steady flight; sometimes a number will swoop down together and the dancing groups, seen with a shimmer as the level rising sun strikes them, are extremely beautiful. These are the prey of dragonflies, and one can see very distinctly the dragonfly, moving back and forward on a level height, striking at and feeding on the May-fly that comes within its range; so far as one can estimate the dragonflies can see a May-fly perhaps a foot off, and as the May-fly company dances, one sees the dragonflies striking out at those on the outside but apparently not seeing any others. Dragonflies are known to be short-sighted and in this case one can see clearly how their short-sight works. This case is

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an exceptional one, as the level sun shows up clearly both the hunter and its prey but the flight of the prey is so distinct one can easily recognise the insect. In most cases it is practically impossible to determine by observation what dragonflies are getting.

Another method has suggested itself; in the field one sees dragonflies sitting on a convenient plant or support and darting off every now and then on the chase. Below such a point, to which the same dragonflies come back constantly, one finds their excreta; we examined some of these, crushing them gently in water on a slide and examining them with a quarter and a sixth inch objective. In those we saw, the excreta were a solid mass of chitinous remains of insects' legs, antennæ, the facetted coverings of eyes, odd pieces and so on. These are not determinable to species, but they are more or less referable to groups ; the characteristic legs of Orthoptera, the hairy legs of Aculeates, the scales of Lepidoptera, the elytra of beetles, the spinous tissues of flies, the scales of Mosquitoes, the scutella or hemelytra of bugs, the legs of Homoptera, are more or less distinguishable, even after exposure to the digestive fluids of a dragonfly. In some we saw the remains were exclusively dipterous, so far as anything definite could be traced, but there was no sign of anything belonging to a mosquito.

In a single instance recently we saw a very small pale-blue Agrionid deliberately eating a Caddis-fly (*Trichoptera*), the common *Æthaloptera sexpunctata* Kol., nearly as big as the little slender dragonfly.

The subject is interesting as we see dragonflies constantly in great abundance; we believe them all to be predaceous; we believe that nearly always they feed on only small insects they can dispose of on the wing, and such small insects are probably in many cases mosquitoes and other small insects which fly in the still air and are easily caught. The mosquito in these days is so important, and so many investigators are on his track that even incomplete observations may give a clue and clearly the dragonfly question is worth attention. The only other method of investigation that occurs to me is to catch and kill dragonflies and investigate their stomach-contents. The direct observation of dragonflies, the investigation of their stomachs and excreta should give data on which to decide what it is dragonflies do eat.

In Poulton's "Predaceous Insects and their Prey" (Trans. Ent. Soc., London 1906, p 399 *et seq*) are given records of the food of dragonflies; 26 cases only are cited showing how very little is known and recorded; the prey includes a fly, a dragonfly, a wasp, a tabanid fly, a Malacoderm beetle, a wasp, another dragonfly, a Coccinellid beetle, a Lycænid butterfly, a May-fly, a Crambid moth, a Syrphid fly, a Galerucid beetle, a Skipper (Hesperiid) butterfly, a Danaid butterfly, and a Termite. The records are probably very one-sided as the prey to be identified must be large enough to be clearly seen, and dragonflies more usually prey on small insects. The subject is one that may be of importance and may perhaps commend itself to some observer in India gifted with patience and leisure.

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In Pusa this year, dragonflies are extraordinarily abundant, and have the appearance of a locust swarm when they hawk together in the still evenings; I have never seen anything approaching the number there are, and not in one place only but all over the country-side. The abnormal rainfall (75 instead of 45 inches) has perhaps enabled them to breed more than usual; it is the larger forms, not the Agrionids, which are abundant. There is also an abundance of *Culex fatigans*, *Stegomyia fasciata* and *Anopheles fuliginosus*; whether the last really conveys the fever that is raging all round or not is not known, but there is a very great abundance of this *Anopheles*, which is now coming more into houses and which particularly shelters in thatched huts and buildings; the enormous abundance of dragonflies has not checked them nor other mosquitoes, and considering the habits of dragonflies it is hardly likely that they would kill mosquitoes.

(*e*)—WHAT IS A SPECIES?

The *Bulletin Scientifique de la France et la Belgique, fasc* 3, contains a long memoir by A. Delcourt, entitled "Recherches sur la Variabilite du genre *Notonecta*" (Enquiry into the Variability of the genus *Notonecta*). Commencing with a discussion of the described European species, the author details researches into the genus *Notonecta* in Europe, founded on collecting and interbreeding, his collecting alone covering 30,000 specimens. The enquiry is directed into determining how far the genus *Notonecta* consists of distinct species, *i.e.*, how far the systematist's recorded species *are* species. He reduces the six or more definitely described species into four "categories valables de classification" which we may roughly describe as "distinct classifiable forms," with variable forms due to habitat. He suppresses one species, creates a new definite one, and extends one to cover so-called species and varieties separated owing to degrees of pigmentation. He concludes that a systemmatist, describing new species from a collection say, necessarily makes mistakes because he takes account only of morphology and cannot take account of differing habitat, etc.; that is, species as described may not be distinct, and what the real conclusion is amounts to this; that there are no definite species, that forms have been derived from each other and from common ancestors, that there are intermediates between so-called species and no clear limits between species can be founded on Morphological characters alone. We give a free translation of what the author believes is the result of this enquiry. "What matters, is not to give names to forms of organised beings, but to distinguish that they are those which are perpetuated in the same state till they vary and to ascertain what are their relations, as much to each other as to their surroundings. Classification is a means, not an end, and, if taken as expounded here, the conception of evolution follows, for, as Tower remarks, new forms are the result of a rapid change in response to external factors. It does not require centuries to show them, it is enough to know how to see them, but for that one must use approximate terms."

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We apologise to the author if we have misunderstood or wrongly translated him, but the gist of his remarks is apparently that the close study of a genus shows that the limits of species are not, in *Notonecta*, definite, cannot be fixed by Morphological characters and that in fact a species as a single definite entity does not exist. Probably all entomologists will agree with the author but not every one will, in the present state of Science, push his conclusions to the practical test and cease to use specific names. It is in every group impossible to fix the limits of species ; two authors naturally cannot agree, as it is not a matter of fact but of personal interpretation of fact, and the two have not before them the same series of facts. The end we seem to be travelling to is chaos and confusion, because no systematic nomenclature will be possible without referring to a *Notonecta* say, as "*Notonecta glauca*, near to *furcata*, Kashmir summer form."

This is however yet to come as few genera have been studied in the detail that Mons. Delcourt brings to it ; the moral is to deal lightly and tolerantly with names and with author's interpretations of them, to realise that systematist's species are not real species, and to make a bad job as good as we can by getting to a reasonable method of classification and nomenclature which will make intercommunication possible between workers and yet not violate too much the natural "species" evolved by Nature and which we must try to define as working entities if progress is to be made at all.

At the present time a "name" is merely a reference to a full description by a specialist and not anything more at all ; the fact that two specimens are given two specific names means that one specimen is referred back to one description and the other to another ; it will be years before specific and generic names can convey any ideas of relationship and descent, and it is useless trying, at present, to make them do so.

The layman is naturally mystified by names, and attributes too much importance to them, as, unfortunately, do many systematists and workers. They are conventions and to be treated as such, to be altered and molested as little as possible, and specific names above all to be regarded simply as reference terms of a wholly artificial kind, due to our profound ignorance not only of what constitutes a species but what species there really are in the world around us.

(*f*).—"Indian Insect Life"

We take this opportunity of drawing attention to a serious mistake in this volume ; fig. 331 on page 495 should be entitled *Hypsipyla robusta*, Mo., and be placed on page 514, where this species is mentioned. The error has been pointed out by Mr. E. E. Green (*Tropical Agriculturist*, December 1909), who has also drawn attention to minor misprints most of which will be obvious to our readers.

(*g*).—The "Coleopterorum Catalogus."

We have received the first five parts of this publication edited by S. Schenkling with a list of contributors well known as specialists in the different

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groups of beetles. It is designed to replace the Munich catalogue published from 1868 to 1876.

Part I deals with *Rhysodidæ*, recording *Rhysodes* with six species from India and *Clinideum* with one.

Part II deals with the *Nilionidæ*, *Othniidæ*, *Aegialitidæ*, *Petriidæ* and *Lagriidæ*; of the first we have none, and India is credited with no *Othniid*, though *Othnius delusus*, Pasc., recorded from Borneo, has been found by Andrewes in the Nilgiris. Of the *Lagriidæ*, we have thirty recorded species from sub-tropical India.

Part III lists the *Cistelidæ*, here called *Alleculidæ*; there are thirty-one recorded species from India, also sub-tropical.

Part IV lists the *Scolytidæ*, exclusive of *Platypodinæ*, here called *Ipidæ*.

It is deplorable in the extreme that this term should be used on grounds of priority solely; the genus *Tomicus* has become *Ips*, the genus *Scolytus* has become *Eccoptogaster*, and, if this nomenclature is to be adopted, the confusion will be awful. If it is not adopted, then this valuable reference work is useless, unless one works up all the changes, and the catalogue might as well not be written.

Scolytidæ are one of the most important families economically; a very large amount of literature exists, none of which will be intelligible in after years, unless the student works up the synonymy first of all. We have nothing but condemnation for this kind of name changing, and it is to be hoped that the body of entomologists will combine together and stop it. If not, the division between the systematists and the biologists (with the economic workers) will widen till there are two sets of nomenclature, the present daily changing one of the systematists, and an arbitrary unchanging one of the practical worker.

Part V takes in *Cupedidæ*, which are not Indian, and *Paussidæ*, of which forty-two Indian species are recorded.

We congratulate the editor and his collaborators on the start made with this great task; such a catalogue is of the very greatest value to all workers, if absolutely authoritative, and it will be welcomed by all who work with Coleoptera; and we hope it will not be marred with radical changes in nomenclature, but that the editor and his collaborators will adhere to the established nomenclature that has been in use for the last fifty years.

Part VI *Apioninæ*.—The author includes in this sub-family the groups *Cylades* and *Eurhynchides* of Lacordaire; *Cylas* is represented in India by three species, of which *C. formicarius*, Fabr., is the well-known Sweet-Potato Weevil. It is amazing that a catalogue such as this is should not record more carefully the geographical distribution of species; *C. formicarius* is given as from India and Ceylon; it occurs also in Australia and the West Indies as a well known pest of sweet-potato. The author also separates *C. turcipennis*, Boh., as a distinct species of Java, Borneo and Sumatra; this is usually reckoned the same species; the author is either in error or has cause for separating them, in which case it should be cited.

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Of the Apionini, 27 Indian species are listed, apart from those of Ceylon and Burma; many of these are Motschulky's species of 1858; very few are recent descriptions, and the group is but imperfectly known in India probably. The author has wholly omitted Motschulky's *A. pruinosum* (Ent. Stud. 1858, VII, p. 92), and Desbrocher's *A. strobilanthi* (Ind. Mus. Notes II, p. 32). The latter was bred from seeds; the only economic species is the "Jute Stem Weevil" which is injurious in Eastern Bengal to this plant. We have *Apion gagatinum*, Mo., and several unidentified species in the Pusa collection. These small weevils occur little in collections and are usually unnoticed by collectors.

(*h*).—GENERA INSECTORUM.

Fascicule 97 is a volume of great bulk dealing with the family *Chalcidæ*, by Dr. O. Schmiedeknecht. The number of described species is enormous, and this volume, like the rest of the series, gives the characters marking the genera and lists the species.

The *Chalcidæ* include the abundant small parasites which destroy insects; many are egg-parasites, many are parasites in such small insects as Aphids, Scale Insects and the like. The fig insects are also included, which occur so abundantly in India.

The Indian species recorded are very few; fifty species are enumerated, of which three are real fig insects, nine are inquilines and parasites of the fig insects, while a bare 38 others have been actually named. There are actually hundreds of species in India but they have been little collected and not described.

Fascicule 98 deals with the sub-family *Nanophyinæ* of the Curculionidæ (Weevils). Nine Indian species of *Nanophyes* are listed. The habits of our Indian forms are wholly unknown, but in Europe, *Nanophyes* are known to live as larvæ in galls, or the larvæ live freely in flowers, feeding on the ovary, or concealed in the flower as in *Tamarix*. These weevils are small, similar to the small *Apion* which also lives in the tissues of plants.

Other recent fascicules do not contain Indian species and need no mention here. The editor, Monsieur P. Wytsmann of Brussels, is to be congratulated on the success of the publication; 99 fascicules have been issued, from the pens of the best experts in each family, beautifully illustrated and well got up; the series is in a fair way to become complete, and entomologists will owe to the editor a great debt of gratitude for having produced a work of such immense value.

H. MAXWELL-LEFROY.

PUSA, *November* 1909.

(*i*).—LIFE-HISTORY OF A LYMANTRID ON CASTOR (*Orgyia postica*, Wlk.).

In December last the castor crop on the Coimbatore farm was found attacked by a species of hairy caterpillar not noted till now. The insect did some

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appreciable injury by defoliating the plants though it was checked by persistent hand-picking. The life-history of the insect was studied and the following is a brief summary of the same.

Egg.—The parent moth lays hundreds of creamy white eggs in clusters and groups, these being very often found attached to old pupal cocoons. Each egg is spherical in shape with a small depression on the upper surface. In measurement each egg is $\frac{3}{4}$ m.m. across.

Larva.—Eight days after laying, these seed-like eggs open and the small caterpillar hatches out. The just-hatched caterpillar is slender, 2 m.m. in length and of a dark colour. The body is fringed with long hairs. The young caterpillars all feed gregariously like several other hairy caterpillars at this stage, moult and grow in size. As it grows and moults take place, changes in structure, size and colour take place. When full-grown the caterpillar measures $1\frac{1}{4}$ inches. The body is more or less cylindrical. The head is hemispherical and of a reddish-brown colour with interrupted yellowish bands along each lateral side. The whole body is covered with hair, the hairs at the tail segment being longer. In addition to the uniform hairy coat, there are other hairy structures very often characteristic of these tussock moth larvæ. On the dorsal surface of the first four abdominal segments are cushion-like pads of white hair one on each segment; these hairy cushions stand upright. At the lateral sides of segments 1 and 2 in the abdomen there is a slender whitish hairy tuft protruding at right angles to the body. On each side of the prothorax is a long dark pencil of hairs pointing forwards and extending a good distance beyond the head. On the median dorsal line of the tail segment is a long tuft of hairs more or less corresponding in position and appearance to the tail spine of sphingid caterpillars. Most of these long tufts of hair are full of small branched spines and are irritating to the touch. The ventral side of the body is of a pale white colour with the legs and prolegs (5 pairs) brownish. The caterpillar when fully fed builds a dirty white transparent cocoon of silk and hair mixed up and pupates within this. The cocoons are generally located in hidden parts of the plant. The pupa is of two kinds. Those of the male are smaller and measure 8—9 m.m., while those of the female are bigger. In colour both are of a pale white colour, that of the female however being of a whiter shade, length 13 m.m. The pupation period lasts from six to eight days.

The male.—The male insect is an active moth, dark brown in colour, with the front wings having patterns of pale blue and brown and the hind wing uniformly dark. The wings expand to 23 m.m. across. The antennæ are prominent and pectinate. The structure of the limbs and the position of the front legs in repose are typically Lymantriid in nature.

The female.—The female insect is apterous and can hardly be distinguished at a glance from the chrysalis out of which it emerged. It is a fleshy mass of dull white colour with the head and limbs very minute, the antennæ are very small and pectinate. The wings are represented by minute pale rudiments at

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the sides of the thoracic region. It measures 13 m.m. in length. On coming out of the pupal case the female clings firmly to the cocoon by means of its tiny limbs. In this posture it remains evidently awaiting the male. Whether impregnated by the male or not, it lays eggs in some hours. Hundreds of eggs are laid and these are cemented in clusters by means of a shiny fluid which hardens on exposure, and all these eggs become attached to the cocoon. When the female has unloaded itself of all the eggs it becomes very much reduced in size and gradually dies.

Experiments in attracting males by taking the apterous female at dusk to the castor plot was tried and numbers of males were attracted. Thus the whole life cycle occupies from egg to imago roughly a month and a half as below :—

Egg	8 days.	roughly 1½ months.
Caterpillar	25 ,,	
Pupa	8 ,,	

The most interesting feature of this insect is the marked sexual distinction. As a pest, the insect is a leaf-eater and feeds gregariously like other Lymantrids and during the younger stages of the larva it can be easily hand-picked with the leaves and destroyed.

T. V. RAMAKRISHNA AIYAR.

(*j*).—BREEDING NOTES ON *EUMENES CONICA*.

A good deal has been observed and recorded of the habits of different species of potter wasps by eminent observers like Horne, Bingham, etc., but I believe that the complete life-history of no Indian species of Eumenes has yet been recorded [Horne, Maindron and Cretin have all published accounts and a short one occurs in *Indian Insect Life*, p. 211. As these notes will interest readers of the Journal, they are inserted in full. H. M. L.]. I venture to think, therefore, that the following rearing notes on *E. conica* will not be uninteresting. In the Coimbatore Agricultural College farm, *E. conica* appears to be the commonest species that boldly enters dwellings and public buildings and builds its nest in odd corners. In December last the red gram crop on the farm was rather badly attacked by caterpillars—chiefly the Noctuid *Chloridea obsoleta*—and a number of these wasps were in evidence. Advantage was taken of this and with the idea of studying the life-history of the wasp, one of these was followed and the results of the observations are as below :—

On the 13th December by about 7-25 a m. the mother wasp commenced building a cell and by about 2 p.m., the cell was complete with the exception of a small circular opening above. The egg was then laid ; this was concluded from the fact that after finishing the cell outline, it went in and came ou after some time. In about half an hour more three big caterpillars of *Chloridea obsoleta* were brought and stored into the cell one after the other in succession. These caterpillars were all full-grown and measured 1¾ inch each. The fourth time the insect instead of returning with a caterpillar as I expected,

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came with a pellet of mud and began closing up the cell opening. Two or three trips more, and the cell was completely sealed up. Soon after this was done I scared away the wasp which was lingering and had the cell with its contents gently removed intact to a breeding cage. The parent wasp, meanwhile returned to the spot where the cell was and searching for about 7 or 8 minutes, flew away in evident despair.

The egg must have been laid at about 2-15 p.m. The cell was then gently opened and the contents examined. Attached to the inner wall by a slender thread was found the egg and within the rest of the space of the cell were closely packed together the three big caterpillars with hardly any extra space for these paralysed creatures for any motion. The egg is a very slender rod-shaped delicate object and measures 3½ m.m. in length. In colour it is whitish. In two days more, *viz.*, by the 15th December the egg was found hatched and the little grub attacking the caterpillar close to it. The grub on hatching measures 4 m.m. and has the same whitish colour with a small shining head and is footless. Within three more days the caterpillars are all consumed and the grub grows in size remarkably. It assumes a stout cylindrical structure and has a ventrally bent posture like that of a cockchafer-grub ; it is of a shining whitish green colour at this stage. For the next ten days the grub continues in the same stage without food, but it spins silk and paves the floor of the cell (the grub was removed to a small pill-box after the three caterpillars were consumed) with a soft matting of transparent white silk. On the 11th day, *viz.*, on the 29th December, the grub moulted and entered the pupa stage.

At this stage the insect acquires all the future organs in miniature ; the wings are found as very minute pads. In colour it is golden yellow. The abdomen is bent ventrally and attached to the slender pedicel by a thin white membrane. The notched eyes gradually turn red, dark-brown and then black in course of a few days. The wings appear as brown patches and gradually enlarge. The insect remained in the pupa stage for 18 days, *viz.*, up to the 16th January, when it cast away the pupal skin and emerged as the adult with all the specific colour markings and features. The wasp, however, is only able to freely move and fly about in two more days. On the 18th the insect completely attained the mature stage. The period of life from egg to imago in this case was briefly as below :—

Egg stage 13th to 15th Dec. 2 days.
Grub stage 15th to 29th Dec. 14 days.
Pupa stage 29th Dec. to 16th Jan. 18 days.

Thus one generation from egg to imago was found to occupy a little more than a month.

T. V. RAMAKRISHNA AIYAR.

(*k.*)—ENTOMOLOGICAL NOTES FROM A RECENT TOUR.

During a recent tour in the Southern Maratha Country, in which only a

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very short time could be devoted to entomological matters, the following notes were made :—

1. At Dharwar, during a walk at 9 a.m. in sunlight on October 29th, 1909, along the Railway cutting, immense numbers of a large pentatomid bug were observed among the stones in which the Railway lines were set. Both males and females were present in abundance and a number of samples were obtained. The bug was sent to Mr. W. L. Distant, and turns out to be a very interesting one belonging to a genus new to the Oriental region. This genus *Anasida* is limited, I understand, to South West and East Africa, and the occurrence of a new species nearly an inch long, is both unexpected and interesting. Mr. Distant has named this *Anasida orientalis*, and will publish a technical description in the near future.

2. On the same day at Dharwar, during a spare hour, I spent my time beating a large number of Lantana bushes in the neighbourhood of the station. From almost every one of these I obtained specimens of the pentatomid bug, *Plautia fimbriata*, in every stage of development. The Lantana is evidently a very suitable host for this bug.

3. A few days later, at Hubli, near Dharwar, about midday, I found the very common pentatomid bug, *Nezara viridula*, playing a new role. On going into a cotton field, I noticed that castor plants were growing at intervals all over the field. I asked the reason for this, and immediately one of the castor leaves was opened out and revealed a full-grown *Nezara* on the leaf. Nearly all the castor plants examined showed these bugs on them, some even in copulation on the leaf. In one case one of the brownish yellow variety was observed in copulation with a pure green type. The castor was ostensibly planted as a trap crop for these bugs among the cotton, to avoid damage to the latter crop.

4. During the same journey, the following bug was obtained at Castle Rock at 5-30 p.m. in flight : *Canthecona parva* and two specimens of a beetle, *Pseudocolaspis longicollis*, Baly., in copulation on grass at 5-30 p.m.

H. H. MANN.

POONA, *February* 1910.

No. XXXI.—THE DISTINCTIONS BETWEEN *TERIAS SILHETANA* AND *TERIAS HECABE*.

These two species are frequently confounded, which is no matter for surprise, as certain specimens are extremely difficult to discriminate. Their life history, however, shows them to be abundantly distinct, and the following characters can, I think, be relied on. The eggs, larvæ and pupæ conform to the usual Pierine type: —

Terias silhetana.	*Terias hecabe.*
EGG.—Laid in rows on the upperside of a leaf in batches of about fifty.	EGG.—Laid singly at the edge of a leaf on the upperside.

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LARVA.—Gregarious living on a web ; food plant usually *Albizzia moluccana.*

Skin somewhat rough greenish yellow or green, with yellowish green lateral line ; head glistening black.

PUPA.—Usually found spun up close together in considerable numbers, usually blackish brown, sometimes pale olivaceous brown with darker mottlings ; rarely pale green.

IMAGO.—Larger. Average ♂ wet form. 40-m. ♀ dry form. 42-m.

More constant in markings. Costa of forewings usually yellow with black scales ; almost always with three spots in the cell on under surface of forewings (53 out of 55). In pronounced dry weather form the large quadrate chocolate spot on under surface of forewings touches the apex and outer margin.

LARVA.—Solitary ; usual food plant the "Madras Thorn," *Pithecolobium dulce.*

Skin smooth pale apple green with whitish green lateral line ; head green, the same colour as the body.

PUPA.—Solitary ; pale green, very rarely pale brownish green.

IMAGO.—Smaller. Average ♂ wet form. 35-m. ♀ dry form. 38-m.

Variable. Costa of forewings usually black or with many black scales (13 out of 16 examined) the black of the outer border sometimes carried along inner margin. Never with more than two spots in cell on under surface of forewing. Sometimes two on one wing and one on the other. Chocolate markings of dry season form linear or triangular with base on costa rarely reaching the apex or outer margin.

The angulated inner border of the black outer margin of the forewing is too variable in both species to afford a useful character for separating them. The other species of this group in Ceylon is *Terias sari* ; Mr. E. Ernest Green informs me that "it is well characterized by the single black streak in the cell on underside of forewing and by the more highly arched costa". It is widely distributed but much rarer than either the above. He also writes :—"The eggs (of *T. silhetana*) are usually deposited more in the form of a dense cluster rather than in definite rows. Bred specimens occasionally have scattered orange scales on the costal area (upper side). The larvæ are very commonly found on *Cassia alata* and *P. dulce*. *T. hecabe* also feeds on various species of Cassia."

N. MANDERS, LT.-COL., R.A.M.C.

COLOMBO, *March* 1910.

No. XXXII.—A GIANT SUNFLOWER (*HELIANTHUS ANNUUS*, LINN.)

The seed was sown in a bed in my garden on the 4th of July last. The soil was very loose ; in fact this once formed a pit into which all the refuse

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from the kitchen, including broken glass and china was thrown, but which is now filled up with broken tiles and some earth. The depth of this pit is about 2 feet.

2. The seed germinated in five days and after 2 weeks the plant began to grow very rapidly. In the beginning of September the lamina of the largest leaf on the plant measured 17″ broad and 16″ long, the petiole of the leaf being 8″ long. The plant attained a height of 9 feet, (I still possess the stem of another plant which grew to the height of 10 feet but its flower head is slightly smaller), and the diameter of the stem at six inches above the ground was 5½″ (in a third plant I had a diameter of 6½″ at 6 inches above the ground and fully 9″ at the base). The terminal flower head appeared in the third week of August and continued to grow in size long after opening, and soon obtained a diameter of 13 inches excluding the ray-flowers which themselves were three inches long. After the corolla shrivelled up the head began to grow very rapidly, indeed at the same time the *seed* was setting. The plant was cut down on the 24th of October, when all the *seed* was perfectly ripe and white. The weight of the whole head immediately after cutting, without any portion of the stem, was 150¼ *tolas*, *i.e.*, nearly 4 lbs. The diameter of this head measured 17″ excluding the bracts. The number of *seeds* was 2,820 out of which 21 were double. The weight of the *seeds* was 14¼ *tolas*, and they were ¾ of a *seer* by the native volume measure.

3. This was the only flower head that the plant produced.

4. It was found necessary to protect the ripening capitulum, by means of a piece of cloth tied round it, from birds such as sparrows and wild pigeons which seem to be fond of the *seeds*.

5. *Helianthus annuus* is very susceptible to influences of heat and light. Thus the cotyledons, when they come up, keep open during the day but close by night, in order to prevent excessive radiation of heat and also to protect the young bud that lies between them. There, however, appear to be some mistaken notions about the heliotropiom of the flower heads, the common belief being that all flowers are turned towards and move with the Sun, which is not exactly correct.

6. When the first (*i. e.* terminal) bud appears, it continues to move with the Sun for some days. Thus in the morning it is turned towards the East, in the middle of the day it points vertically upwards and in the evening towards the West. The duration of the period of these mutations, depends upon the condition of the weather and the vigour of the plant. Once the flower head is open, all movement ceases, the peduncle taking a definite position and becoming rigid. Most of the terminal flowers face the East. The secondary heads which are produced on the axils of leaves show no power of movement. About the time that the whole plant is ripe and about to dry up, resin has formed in abundance in all the parts of the plant (especially the apical ones), which give out a sweet scent.

7. There are many interesting problems connected with the growth and

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the process of fertilization of Sunflowers, and I hope to arrive at some important results after another season's trial.

S. V. SHEVADE,
Asstt. Imperial Economical Botanist.

KIRKEE, *9th November* 1909.

No. XXXIII.—SCIENTIFIC NOMENCLATURE.

With reference to Mr. Meyrick's correction of my note regarding the gender of the word "Lygosoma" I should like to be allowed to make a few remarks in defence of my plea. First, then, I must thank Mr Meyrick for pointing out the error, and can only offer my apologies to Major Wall and any others whom I may have temporarily misled. At the same time I would remark that the note was written as a "plea for uniformity," and I had no desire to set myself up as an authority on the subject (*vide* the words "I fancy" in my note); though I admit that I did not doubt at the time that the word should be neuter. Thanks to Mr. Meyrick, I now see the error and admit it, but I would not withdraw the plea. Instead I would address it to the attention of Mr. Boulenger, Sir Joseph Hooker and other authorities to whom we look for our information in matters scientific. I mention Sir Joseph Hooker, because, if what Mr. Meyrick tells us is correct which I do not doubt, then we must surely say *Melastoma malabathrica*, etc. Surely also we must not say "*Lycodon aulicus*" nor "*Oligodon dorsalis*" in speaking of those snakes, but must make them neuter. Another matter of nomenclature which has always annoyed me is the apparently arbitrary way in which the final "i" of proper names attached to species is doubled or not. Either it is correct to double it or it is not. I imagine that it is not to my mind, even euphony does not require it, but perhaps Mr. Meyrick will be able to spare a moment of his valuable time to inform us definitely? There is no lack of instances, thus Blanford, though usually writing but one "i" in the volume dealing with Mammals of the *Fauna of B. I.* series, has written "*Hardwickii*" (page 340). It is only the very great importance, as it seems to me, of accuracy in all details connected with Natural History, which induces me to continue the subject, and not any desire to open in our columns a controversy on the vexed question of priority and usage, which does not appear to be affected seriously by such minor alterations. By way of further apology for my own inaccuracy, I may say that, though I am now a constant reader of *Nature*, I have not been so for very long, and consequently did not see Mr. Meyrick's note on the subject to which he refers.

F. E. W. VENNING.

HAKA, CHIN HILLS,
19th January 1910.

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No. XXXIV.—THE PRESERVATION OF NATURAL HISTORY SPECIMENS.

With reference to Mr. Comber's interesting series of papers on the preservation of Natural History specimens, I should like to give you a few of my experiences which I trust may prove of benefit to some members.

FORMALIN.

This is no doubt of the greatest service to the field naturalist when travelling, as has already been pointed out, when spirit is not available. But it has serious drawbacks. Fishes immersed for any length of time in this medicine are apt to get brittle as regards their fins and tails. Mr. Boulenger at the Natural History Museum was pointing this out to me the other day, and he says it is exceedingly annoying when the identification of a particularly valuable specimen is desired, to find when attempting to count the fin rays this organ break right off. Formalin, too, is a dangerous medicine to recommend to the tyro, who, ignorant of the right strength to use, will doubtless ruin many a valuable specimen until he has learnt, as I have done, from sad experience, the right proportions of formalin and water; and here no hard and fast rule can be laid down. If used too strong specimens curl up in it. If this be the case it can to a certain extent be remedied thus:—take out the specimen from the formalin and soak for about 24 hours in water. Then dry with a clean cloth and stretch the fish or other specimen out on a piece of wood or stick fastening it to this by binding round with stout thread or string Next immerse the specimen in strong spirit for several days after which the support may be removed, and the specimen will then retain much of its former straightness. Formalin also completely destroys the silvery and golden lustre on many fishes. I have found it excellent for reptiles batrachians, and have at the present time a lizard and snake which I kept for over two years in a 25 per cent. solution of formalin. These were subsequently transferred to spirit and to-day retain all their colours and marking as they did when freshly killed. By the way I have found snakes "go wrong" more quickly in spirit than any other specimens. Fishes I have kept for about three weeks in a fairly weak solution of formalin and then transferred, retain much of their natural brilliancy, but as colour is of little or no importance for the determination of a species this counts as trifling. I would strongly urge whenever possible the use of spirit and leave formalin—severely alone. For soft bodied animals, such as tadpoles, jelly fishes, and the ova of frogs formalin is of the greatest use, but a very weak solution should be used, say, about 4 per cent. These should be allowed to thoroughly harden in this before being transferred to spirit. The colours of fishes, if desired, may be preserved, to a great extent, so Mr. Boulenger informs me, by being kept in weak spirit in the dark. But in a hot climate like India this is not always practicable. My advice to the amateur would be to experiment with common specimens first in different solutions of formalin and spirit keeping a careful watch daily

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to see how they are getting on, before trying his hand on valuable specimens. It may not be out of place here to urge the absolute necessity for the collection of fishes for the National Museum. Things Indian are to a great extent but poorly represented there as regards other countries, and a case in point came under my notice when I was showing Mr. Boulenger some fishes from Bengal, he expressed a wish to retain them in the collection, as it appears the Museum had no fishes whatever from that particular locality, with the exception of a few I presented some years ago. Specimens, however common, have often a particular value as coming from some little known locality.

GORDON DALGLIESH.

BROOK, GODALMING, SURREY.
March 1910.

[We cordially endorse Mr. Gordon Dalgleish's appeal for specimens of Indian fishes for the National collection, and trust that our members will be able to help in this direction At the same time we should like to add that our own Museum is sadly lacking in specimens of fishes and batrachians.—EDS.]

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PROCEEDINGS

OF THE MEETING OF MEMBERS HELD ON 3RD FEBRUARY 1910.

A meeting of the members of the Bombay Natural History Society took place on Thursday, 3rd February 1910, at the Society's Rooms, Mr. C. L. Burns presiding.

The election of the following 127 new members since the last meeting was duly announced :--

Mr. H. G. W. Meikle, Bombay ; Capt. R. E. Lloyd, I.M.S., Calcutta ; Mr. R. D. Austead, B.A., Bangalore ; Rev. J. Redmond, Mysore ; Mr. Neville B. Parish, Alwar ; The Rector, St. Mary's College, Bombay ; Mr. N. Mosley, Multan ; Mr. M. S. Jayakar, M.A., Alibag ; Capt. R. S. Kennedy, I.M.S., Calcutta ; Miss A. Thompson, Beetul ; Mr. H. M. M. Davidson, Assam ; Mr. C. H. Craven, Chittagong ; Mr. A. C. M. Binny, Ferozepore ; Capt. C. Hudson, I.M.S., Bangalore ; Capt. C. Saunders, Wellington ; Mr. W. S. Davis, Kurram ; Dr. D. A. Turkhud, M.B., C.M., Satara ; Mr. C. Bateman, Jalpaiguri ; Mr. F. Dewar, I.C.S., Balaghat, C. P. ; Mr. J. Doyle, Balaghat ; Major C. A. Sykes, R.H.A., Bangalore ; Lt. E. J. Headlam, F.R.G.S., R.I M., Bombay ; Mr. S. R. Parsons, Mandla ; Lt.-Col. H. C. Bernard, Nasirabad ; Mr. Walter J. Smith, Ceylon ; Mr. Charles Innes, B. Sc., Rangoon ; Capt. A. C. Wilkinson, Rawal Pindi ; Capt. R. T. Wells, I.M.S. ; Capt. J. Cunningham, I.M.S., Bombay ; Capt. W. D. H. Stevenson, I.M.S., Bombay ; Capt. J. Taylor, Bombay ; Mr. R. P. Scott, Bombay ; Mr. Aga Cassem Shah, Poona ; Mr. N. O'Reilly Blackwood, Secunderabad ; Mr. H. J. Shaw, Bombay ; The President, Leicestershire Regiment, Belgaum ; Capt. W. B. T. Abbey, I.A., F.R.G.S., Kyaukse ; Mr. Clarence E. Rushton, Mandalay ; Mr. R. S. Lister, *via* Ghoom ; Mr. A. A. Blake, Sara ; Mr. H. F. Bowden, Rangoon ; Mr. F. B. Thomas, Kanchrapara ; Mr. A. O. Weller, Kanchrapara ; Mr. E. G. P. Phythian-Adams, Poona ; Mr. George Evans, Hoshangabad ; Mr. E. F. G. Bourchier, Peshawar; Mr. Arthur E. Devas, Quetta ; Mr. Philip Shepherd, Quetta ; Mr. H. H. Jenkyns, I.C.S., Lahore ; Capt. George C. Lambton, D.S.O., Nilgiris ; Mr. H. L. Dutt, Sabour : Mr. G. P. Hector, M.A., B. Sc., Dacca ; Mr. Charles Mackinlay, Edinburgh ; Mr. E. Norman, Dacca ; Lt. C. S. Carter, R.N., E. I. Station ; Mr. J. E. Armstrong, Katha ; Mr. J. N. D. La-Touche, Bombay ; Mr. N. B. Baxter, Dhulia ; Mr. A. L. Bacon, Mogok ; Mr. C. H. Harrison, I.C.S., Punjab; Mr. F. L. Core, Deesa ; Mr. L. M. Stubbs, I.C.S., Jalaun ; Mr. A. P. Morris, B. Sc., U. Burma ; Major A. G. Kemball, Nowshera ; Mr. N. L. M. Carruthers, Jhansi ; Mr. A. E. B. Parsons, Dargai ; Mr. W. P. Field, Jalpaiguri ; Mr. R. R. Gales, Calcutta ; Mr. R. P. W. Strong, Bombay ; Mr. E. G. Drake-Brockman, Dacca ; Mr. W. S. Coutts, Dacca ; Major J. H. Hudson, Meerut ; Lieut-Col. Simpson Powell, M.D., R.A.M.C., Rangoon ; Col. A. R. Denne, Manipur ; Mr. P. N. Arthur Lucas, Bellary ; Dr. W. D. Jones, Kyaukse , Lt.-Col. A. Short, R.H.A.,

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Mhow ; Mr. E. G. Gregson, Peshawar ; Mr. J. E. Aspinwall, Bombay ; Mr. W. E. M. Campbell, I.C.S., Allahabad ; Mr. Charles Legard, Mercara ; Mr. A. S. Brook, Ferozepore ; Mr. T. E. Bromley, I.C.S., Khandwa ; Mr. N. J. Roughton, I.C S., Khandwa ; Capt. J. L. Lunham, Aurungabad ; Mr. G. P. Andrew, I.C.S., Mergui ; Mr. A. D. Spence, Rangoon ; Mr. J. C. MacGeorge, Moulmein ; Mr. T. S. Pipe, Nasik ; Mr. V. A. Herbert, Moradabad ; Mr. F. Roddis, Dacca ; Mr. H. S. Warburton, I.C.S., Lucknow ; Major P. Wheatley. R.F.A , Jubbulpore ; Mr. Charles H. Bury, Meerut ; Mr. J. W. G. Davis, Mandla ; Mr. Carl. H. A. Muller, Lahore ; Mr. E. W. Stoney, C.I.E., Coonoor ; Mr. E. H. Hudson, A.M. I.C E., Jalna ; Mr. R. St. J Mitchell, Nanded ; Mr. Herbert Clive, Myitkyina , Major C. F. Harrison, Rangoon ; Mr. Walter Armiston, Haldummulle, Ceylon ; Mr. T. M. Evans, Panchgani ; Mr C. H. Bennett, Chatrapur ; Capt. Godfrey Heseltine , Madras ; Mr. Edgar de Lantour, Sitapur, U.P. ; Mr. N. A. Macleod, Calcutta ; Major F. G. Bayley, Trimulgherry ; Lt. G. P. A. Bracken, R.A.M.C., Trimulgherry ; Mr. P. S. Patuck, I.C.S., Wardha ; Mr. E. P. Comber, Bombay ; Mr. R. C. Bellairs, Almora ; Mr. E. J. Murphy, Rangoon ; Mr. F. M. Wainwright, Kistna ; Mr. H. F. Saunders, Gwalior ; The Curator, Central Museum, Lahore ; Major R. Bird, I.M.S., Calcutta ; H. H. the Raja of Cochin ; Mr. T. H. Waddingham, Phillaur ; Mr. L. B. Holland, Lahore ; Mr. A. G. Tweedie, Calcutta ; Mr. H. P Herbert, Travancore ; Mr. R. W. L. Cater, I.C.S., Sibi, Baluchistan ; Mr. P. H. Welman, Bombay; The Mess President, R.A. Mess, Colaba, Bombay ; Mr. A. F. Gradon, I.F.S., Jubbulpore ; The Principal, Veterinary College, Palghat, and Mr. H. Sharp, Shillong.

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following contributions to the Museum since the last meeting:—

Contribution.	Locality.	Donor.
Wild dog (*Cuon dukanensis*) skin	Kumaon.	N. F. Troup.
Do. do. do. do.	Burma	C. Hopwood.
Walton's Mountain Fox (*Vulpes waltoni*).	Gyantse	Capt. F. Bailey.
Small Palm civet (*Paradoxurus niger*) ...	Madras	Capt. W. S. Patton, I.M.S.
Small Indian Civet (*Viverricula malaccensis*)	Panvel, Colaba Dist.	Rev. J. H. Lord.
Large Red Flying Squirrel(*Pteromys oral*).	Chandanpura ...	O. O'Donell.
2 Squirrels sp. ?	S. Shan States	Capt. R. D. Macgregor, I.M.S.
2 Rats (*Mus rattus*), ...	Laccadive Islands...	R. H. Ellis, I.C.S. and Comdr. Huddleston.
2 Sind Mole Rats (*Gunnomys sindanus*).	Karachi	E. Comber.
A large number of Rats in spirit, including examples of *Tatera*, *Gunomys*, *Mus*, &c.	Lahore Dist.	Capt. G. Davys, I.M.S.

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Contribution.	Locality.	Donor.
1 Markhor head	Chitral	H. H. the Mehter of Chitral.
Ibex head	Do.	Do. do.
Urial head, picked up, 39½ ins.	Seistan	Major Kennion.
8 Goral heads	Kathgodam	H. E. Johnston Stewart.
Brow-antlered Deer (*Cervus eldi*)	Thayetmyo	J. B. Leach, I. C. S.
3 Chinkara heads (*Gazella bennetti*)	Cutch	H. H. the Rao of Cutch.
Mounted head of Musk deer	Chamba	Major Rodon.
21 Bird skins including specimens of Tibetan Sandgrouse and Waddell's Babbler.	Gyantse, Tibet	Capt. Kennedy, I.M.S.
3 Red breasted Paroquets (*Palæornis fasciatus*)	Assam	E. O. Shebbeare.
Woodcock (*Scolopax rusticula*)	Kanara	T. R. Bell.
Eastern Solitary Snipe (*Gallinago solitaria*)	Assam	E. C. Stuart Baker.
Wood Snipe (*Gallinago nemoricola*)	Do.	Do.
Semi-albino Fan-tailed Snipe (*G. cœlestis*)	Panvel (Bombay)	H. C. Wright.
Semi-albino Pin-tailed Snipe (*G. stenura*)	Ratnagiri	J. H. Garrett, I.C.S.
Several birds including Cotton Teal (*Nettopus coromandelica*), Spotbill (*A. pœcilorhyncha*), Garganey (*Q. circia*)	Daman Road	R. L. Sinclair.
Crested Teal (*Eunetta falcata*)	Roorkee	E. H. Kelly.
Semi-albino Babbler	Vellore	J. C. Battie.
39 Snakes including a new variety of Cobra (*Naia tripudians, Dip. ceylonensis, Trop. platyceps, Trop. beddomi, O. erythrogaster*)	Various	Major F. Wall, I.M.S.
4 Green Vipers (*Lachesis gramineus*) (alive)	Tindharia	A. Wright.
12 Snakes including *V. russelli* and *S. theobaldi*	Burma	Lt. F. W. Wells.
3 *Zamenis rodorachis ladacensis*	Mohammerah, Persian Gulf	Lt. A. T. Wilson.
A collection of Snakes, including a new species (*Trop. venningi*)	Chin Hills	Lt. F. E. W. Venning.
10 Snakes, including *Ablabes frenatus* and *Trop. subminiatus*	Burma	D. H. M. Boyle.
3 Snakes	Khandesh	S. D. Smith.
1 Himalayan Viper (*Ancistrodon himalayanus* and *Trop. platyceps*)	Dalhousie	Col H. W. Barrow, R. A. M. C.
A collection of 27 Snakes, 2 Mammals and a number of Insects	Rangoon	Dr. H. Marshall.
1 Krait (*Bungarus candidus*) and 1 *Trop. piscator*	Santa Cruz, Salsette	R. W. Dunlop.
1 *Dryophis pulverulentus*	Castle Rock	P. Gerhardt.
2 Chameleons	Ahmedabad	W. Bulkley.
A number of Beetles	Chin Hills	F. E. W. Venning.
Do.	Mussoorie	C. Batten.
Do.	Burma	Capt. R. D. Gregory
Do.	Darjeeling	E. Ollenbach.
Do.	Garhwal	A. G. Lyell.
Do.	Salem Dist.	Capt. E. S. Gillett.
Do.	Colombo	F. M. Mackwood
Do.	Cuddapah	O. Beadon.
Do.	Sonapur, Assam	L. G. Middleton.

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Contribution.	Locality.	Donor.
A number of Beetles	Trimulgherry	Capt. E. B. Fredricks
Do.	Kurseong	E. A. D'Abrue.
A large number of Lepidoptera	Kanara	T. R. Bell.
A number of various insects	Karachi	E. Comber.
Do. do.	Khandesh	S. D. Smith.
Several snakes, fishes and crustaceans	Persian Gulf	Lt. F. J. Blackman.
Some Marine invertebrates	Bombay	S. H. Prater.
The collection of Marine shells belonging to the late E. H. Aitken	Colaba and Karachi	Anonymous.
Double Cocoanut	Bassein	Hurgodum Vunmali

Minor contributions were received from Messrs. B. Aitken ; F. H. Abraham ; P. C. Briscoe ; B. C. Carter ; A. T. Evans ; W. P. Field ; Miss Goldney ; Mr. F. Hannyngton, I.C.S. ; Dr. E. Hunt ; Messrs. H. R. Hume ; F. G. Hutchinson ; A. E. Lowrie ; E. Lund ; Mrs. Millard ; Dr. H. H. Marshall ; Messrs. P. L. Piris ; J. M. Rebello ; B. D. Richards ; C. J. Silvester ; Dr. D. A. Turkhud and Mr. A. Wright.

ELECTION OF THE COMMITTEE.

The following gentlemen were elected as office bearers for the present year :—*President* : H. E. Sir George Clarke, F.R.S., G.C.I.E. *Vice-Presidents* : Mr. J. D. Inverarity, B.A., LL.B. ; Rev. F. Dreckmann, S.J. ; and Mr. N. C. Macleod. *Managing Committee* : Mr. E. C. Stuart Baker ; Lt.-Col. W. B. Bannerman, I.M.S. ; Mr. T. R. D. Bell, I.F.S. ; Mr. H. Bulkley ; Mr. C. L. Burns ; Mr. E. Comber, F.Z.S. ; Lt.-Col. G. H. Evans ; Prof. G. A. Gammie ; Mr. E. Ernest Green ; Lt.-Col. K. R. Kirtikar, I.M.S. (Retd.) ; Mr. H. Maxwell Lefroy ; Mr. J. McNeill, I.C.S. ; Mr. G. M. Ryan ; Major F. Wall, I.M.S., C.M.Z.S. ; Mr. John Wallace, C. E. ; and Mr. N. B. Kinnear. *Honorary Librarian* : Mr. B. D. Richards. *Honorary Treasurer* : Mr. L. H. Savile (*ex-officio*). *Honorary Secretary* : Mr. W. S. Millard (*ex-officio*).

THE ACCOUNTS FOR 1909.

The Honorary Treasurer, Mr. L. H. Savile, presented the statement of accounts for 1909, which, he remarked, showed a satisfactory result. The subscriptions for the year were Rs. 16,831-8-4, showing an increase of Rs. 2,374-8-7 over the previous year. The entrance fees were Rs. 2,770 compared with Rs. 1,480 for 1908 and 294 new members had been elected during 1909 against 160 in 1908.

The accounts were duly passed subject to the usual audit.

Mr. C. D. Mahaluxmivala exhibited a specimen of a bamboo (*Bambusa arundinacea*) which was now flowering in the Victoria Gardens, Bombay. One clump flowered last year and it was considered abnormal, but the same clump

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had flowered again this year and also another clump in a different place. Unfortunately there was no trace as to when these bamboos were planted or from whence they came. Some of the seed was exhibited and a young plant raised from the seed last year.

Mr. Mahaluxmivala also exhibited some seeds of the Talipot palm (*Corypha umbraculifera*), one of which flowered last year in the Victoria Gardens and another in the Elphinstone Circle Gardens.

Mr. John Wallace, C.E., and Lt.-Col. K. R. Kirtikar, I.M.S. (Retd.), read a paper on "The Giant Creeper" (*Calycopteris floribunda*), exhibiting specimens of the plant and sections of the trunk.

PROCEEDINGS OF THE MEETING HELD ON 7TH APRIL 1910.

A meeting of the members of the Bombay Natural History Society took place on Thursday, 7th April 1910, at the Society Rooms, Colonel W. B. Bannerman, I.M.S., presiding.

The election of the following 34 new members since the last meeting was duly announced :—Mr. S. F. Ellis, Jacobabad ; Mr. Liladhar Sunderji Roy-Sampat, Bombay ; Mr. C. T. Symons, Colombo ; Mr. Herbert A. Heath, Matugama, Ceylon ; Mr. W. Lilburn, Lucknow ; Mr. H. P. Thomasset, Cascade, Mahe, Seychelles ; The Superintendent, University Museum of Zoology, Cambridge, England ; Mr. Melville Leslie, Bombay ; Major W. H. Kenrick, I.M.S., Khandwa ; Mr. Harold Fowler, New York City, U.S.A. ; The Principal, P. R. Training College, Ahmedabad ; Mr. W. A. H. Miller, Karwar, Kanara ; Mr. G. S. Butterworth, Belgaum ; Hon'ble Mr. Justice S. M. Robinson, Rangoon ; Major A. D. Greenhill Gardyne, Cawnpore ; Sub-Lt. D. Webster, R.N., (H.M.S. "Fox"), East Indies Station ; Miss M. Hazlewood, Rangoon ; Mr. W. S. Thom, Paletwa, N. Aracan ; Capt. G. H. T. Graham, London ; Mr. J. M. Wright I.C.S., Shwegu, Burma ; Mr. L. Donaldson, Phillaur, Punjab ; Mr. K. J. Luke, Chatalpara, E. Bengal ; Mr. Robert T. Harrison, A.M. I.C.E., Sukkur ; Mr. R. B. MacLachlan, Sukkur ; Mr. F. A. Wrigley, Rangoon ; Mr. J. V. Young, I.F.S., Pyinmana ; Dr. P. W. Quinn, Betul, C. P. ; Mr. E. S. Thomas, I.C.S., Palghat ; Lt.-Col. R. H. Penton, R.A.M.C., D.S.O., Poona ; Mr. H. D. Rice, Maritranve, Mysore ; Capt. R. P. Quin, Cawnpore ; Mr. J. S. Fraser, Madras ; Mr. D. Squire, Cannanore, S. Canara ; Mr. W. Harrold, Ahmedabad, and Mr. F. M. B. Rosenthal, Secunderabad.

CONTRIBUTIONS TO MUSEUM.

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following contributions to the Museum since the last meeting :—

Contributions.	Locality	Donor.
2 Panther cubs (alive)	Kanara	W. H. Miller.
2 Indian Pine Martens (*Mustela flavigula*.)	Kangra Dist., Himalayas.	General W. Osborn.

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Contribution.	Locality.	Donor.
1 Jackal (*Canis aureus*)	Savantwadi	Major F. W. Berthon.
1 Fox (sp. ?)	Persian Gulf	Lt. Carter, R. N.
1 Hairy-footed Flying Squirrel (*Sciuropterus pearsoni*)	Aracan Hills	C. W. Allen.
Head-skin and skull of Four-horned Antelope (*Tetracerus quadricornis*)	Jamooee, E. B. S. Ry.	A. G. Tweedie.
Head of Pelzelin's Gazelle (*Gazella pelzelni*)	Somaliland	Lt. Hunt, R. N.
Head, skin and skull of Thar (*Hemitragus jemlaicus*)	Kulu	General Osborn.
2 Himalayan Serow (*Capricornis sumatrensis*) skulls	Naini Tal	Lt. G. Whittel.
Deformed Sambhar (*Cervus unicolor*) skull.	Burma	Lt.-Colonel H. B. Thornhill.
Muntjac (*Cervulus muntjac*)	Madura	C. B. Beadnell.
3 Bats (sp ?)	Darjeeling	E. A. D'Abrue.
105 bird skins, including White-spotted Blue-throat (*Cyanecula wolfi*) Red-spotted Blue-throat (*Cyanecula suecica*) Robin Accentor (*Tharrhaleus rubeculoides*), Brown Accentor (*Tharrhaleus fulvescens*), Jerdon's Accentor (*Tharrhaleus jerdoni*), Black and yellow grosbeak (*Pyenorhamphus icteroides*), White-winged grosbeak (*Pyenorhamphus carneipes*), Ibis bill (*Ibidorhynchus struthersi*), Temmincks Stint (*Tringa temminckii*) and Brahminy Duck (*Casarca rutila*) in down	Kumaon, Garhwal and Kashmir.	S. L. Whymper.
60 bird skins, chiefly Cuckoos, including Common Cuckoo (*Cuculus canorus*), Himalayan Cuckoo (*Cuculus saturatus*), *C. poliocephalus*, *Hierococcyx sparverside*s, *H. varius*, *Cacomantis merulinus*, *Chrysococcyx maculatus*, *C. xanthorhynchus*, *C. maculatus*, *Coccystes coramandus*, *Surniculus lugubris* and *Eudynamis honorata*	Various	E. C. Stuart Baker.
Scops Owl (*Scops giu*)	Kanara	T. R. Bell.
Pied Imperial Pigeon (*Myristicivora bicolor*) and Sheldrake (*Tadorna cornuta*)	Arakan	.....
2 Aracan Hill Partridges (*Arboricola intermedia*)	Do.	C. W. Allen.
Crested Teal (*Eunetta falcata*) ♂	Roorkee	Capt. Mainprice, R. E.
1 Snake (*Dipsadomorphus forsteni*)	Orcha	H. H. Raja Bahadur Orcha.
200 Insects including 155 Butterflies of 76 species, some Moths and Dragonflies (*Neuroptera*)	Various	Capt. G. H. Graham
A small collection of Beetles	Darjeeling	E. A. D'Abrue.

Minor contributions from L. H. Savile; G. L. Corbet, I. C. S.; Col. Bull; E. R. H. Jackson; Major F. W. Berthon and S. Navalkar.

PAPER READ.

The following paper was read :—"The Natural History of Bombay malaria" by Dr. C. A. Bentley.

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Dr. Bentley, in the course of his paper, said :—

Modern Preventive Medicine has had to borrow very largely from other sciences and in particular has received immense assistance from students of Natural History. This is clearly shown by the present state of our knowledge regarding malaria. Laveran's discovery first attracted Naturalists to the study of malaria, but it was Ross' magnificent work which led to real alliance between Natural History and Sanitary science.

The Natural History of malaria can be approached from three different aspects : (1) As it relates to the malarial organism ; (2) as it affects men, the human animal ; (3) and lastly as it applies to the alternative host—the *anopheles* mosquito.

It is the latter aspect with which we shall deal to-night. In November 1908, Capt. Liston announced his discovery, that the species of mosquito responsible for the dissemination of malaria in Bombay was *N. stephensi*. This discovery is of very great importance, as a careful examination of Bombay shows that we are justified in assuming that *N. stephensi* is the only mosquito able to carry malaria that is present in the greater part of the city. This being so, it is necessary to learn everything we can about the Natural History of this mosquito in order.

Dr. Bentley described at length the different type of breeding places in which *N. stephensi* was to be found, and after discussing the habits of the insect and the causes which lead to its spread, indicated the measures which could be adopted for reducing the number of the insects and eventually control it. He exhibited specimens of the small mosquito destroying fish "Piku" and some of the water-weed *Wolffia arhiza*.

Col. Bannerman called attention to the fact that the first intimation that *N. stephensi* was the cause of the epidemic of malaria in Bombay was in a paper read before this Society by Capt. Liston, I.M.S., in 1908, and that another member of the Society, the late Mr. E. H. Aitken, had been the first to call attention to the mosquito devouring fish "Piku" referred to and exhibited here by Dr. Bentley.

Col. Bannerman also said it would be a good thing if all the members of the Bombay Corporation were members of the Society, so that they could obtain some information from such papers as these, since the information would be of great value to them.

A hearty vote of thanks was passed to Dr. Bentley for his interesting paper which will be published in full in the Society's Journal.

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JOURNAL
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Oct. 1910. Vol. XX. No. 2.

THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. Stuart Baker, F.L.S., F.Z.S., M.B.O.U.

Part II.

(With Plates II & III.)

(Continued from page 32 of this Volume.)

Family—CHARADRIIDÆ.

Genus GALLINAGO.

The Genus Gallinago contains seven species of Snipe as found in India in addition to the sub-species *G. raddei*. Of these seven species one is the Jacksnipe, *G. gallinula*, which is by many naturalists placed in a separate genus, *Limnocryptes*. The differences, however, between this and the other Snipe consist mainly in their internal structure, such as the sternum which has four instead of two emarginations. These differences are not apparent to the Field Naturalist or sportsman, and I therefore follow Blanford and unite all our Indian Snipes in one genus.

Since the fourth volume of the "Avifauna of British India" was written we have added both *Gallinago major* and *Gallinago megala* to our list of Indian birds so that these have now to be incorporated in the key to the species.

The differences between the Common Fantail, *G. coelestis typica*, and the Eastern Fantail, *G. coelestis raddei*, all depend upon comparison and are dealt with when these birds are described.

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The following key is one which should suffice to enable any one to distinguish the various Snipes and the distinguishing measurements given in it allow for an ample margin on either side. Thus it will be found that whereas the Jacksnipes bill rarely exceeds 1·8, that of the other Snipes will but seldom be found under 2·2 and that, probably, only in birds of the first year.

KEY TO SPECIES OF GALLINAGO.

A.—A pale median band on crown, bill exceeding 2″.
- *a.* Wing exceeding 6″, borders of scapulars white. *solitaria.*
- *b.* Wing under 6″, borders of scapulars buff or rufous buff.
  - a^2 Distance between tip of shortest secondary and that of longest primary not exceeding 2″. *nemoricola.*
  - b^2 Distance between tip of shortest secondary and that of longest primary exceeding 2″.
    - a^3 Outer tail feathers narrow and stiff, under ·3″ broad.
      - a^4 Tail feathers 26 in number, the 8 outer on each side less than ·2″ broad ... *stenura.*
      - b^4 Tail feathers 20 in number, the 6 outer on each side less than ·3″ broad ... *megala.*
    - b^3 Outer tail feathers not exceptionally narrow or stiff.
      - a^5 Three outer tail feathers not pure white and marked with dusky spots and bars ... ... *coelestis.*
      - b^5 Three outer tail feathers pure white unmarked ... ... *major.*

B.—No pale median band on crown, bill always less than 2″ ... ... *gallinula.*

GALLINAGO SOLITARIA.

The Eastern Solitary Snipe.

Gallinago solitaria.—Hodg. Gleanings in Science, iii, p. 238, (1831); *id.* J. A. S. Bengal, vi, p. 491; Blyth, Cat., p. 272; Jerdon, B. of I., iii, p. 673; Stoliczka, J. A. S. Bengal, xxxvii, pt. 2, p. 70; Blanford, *ibid.* xli, p. 73; Hume and Hender, Ladak

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to Yarkand, p. 286; Prjev. In Rowley Orn. Misc., iii, p. 91; Hume Cat. 869; Scully, S. F., viii, p. 353; Hume and Marsh, Game B., iii, p. 333; Hume, S. F., ix, p. 283; Sculley, J. A. S. Bengal, lvi, p. 87; Hume, S. F., xi, p. 319; Fletcher, "Asian," Feb. 1898; Sharpe, Cat. B. M. xxiv, p. 654; *id* Hand-list, Vol. i, p. 166; Blanford, Avifauna B. I., iv, p. 290; Oates, Cat., Eggs, B. I., ii, p. 64; *id*, Game B. of In., ii, p. 446; Finn, Indian Waders, p. 142.

Scolopax solitaria.—Seebohm. Charadriidæ, p. 475.

Vernacular names.—Bon chaha, *Hindi*; Bharka, *Nepal*; Simpoo, *Khasia*; Daodidap gophu, *Cachari*; Boner kocha, *Assamese*.

Description.—Adult male.—Crown black, spotted with rufous and with a narrow white median band often much broken up with brown. A broken supercilium narrowing behind the eye white, more or less mixed with brown. Loral streak dark brown, more or less mixed with rufous. Chin, sides of head and throat white, speckled with dark brown and rufous, the centre of the throat almost pure white. Neck all round rufous brown, much mixed with white below, darker and less mixed with white above but having also dark brown or black bars. Back and scapulars black with numerous broken bars and spots of rufous and the scapulars with broad white outer edges, in some cases tinged with rufous. Lower back deep brown with whitish tips and bars, rump with rufous spots, shorter tail coverts dark brown with rufous bars and longer coverts almost uniform olive brown, rayed darker and with white bars at the tips. Median tail feathers black, tipped whitish and with a narrow black and a broad subterminal band of rufous; outer tail feathers irregularly barred black and white. Breast brown, more or less speckled and spotted with white which forms into broad bars where the breast and abdomen meet. Abdomen white, faintly barred at the sides; flanks, axillaries and underwing coverts barred brown and white, the latter predominating. Undertail coverts white, sometimes practically unmarked and sometimes faintly barred with dusky brown and often with a faint rufous tinge.

Wing coverts brown, speckled with rufous next the scapulars and elsewhere barred with rufous and black and tipped white;

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the edge of the shoulder is also barred with white; primaries dark brown edged and tipped with white, the edges broadest on the outermost quill and almost disappearing on the innermost; secondaries dark brown, tipped white with frecklings of rufous and black at the tip which in the inner secondaries become regular bars throughout the whole length of the feathers.

Bill greenish plumbeous, darkest at the tip where it is almost black, and yellowish at the base of the lower mandible; iris dark brown; feet and legs pale yellowish plumbeous, the soles yellow ochre and claws horny brown.

"Bill plumbeous, black at tip, base of lower mandible yellowish brown; feet dull olive or pale yellowish green, the soles yellowish; claws horny black; iris dark brown" (Scully).

"Total length 11 inches, culmen 2·9″, wing 6·3″, tail 2·3″, tarsus 1·3″" (Sharpe).

"Wing 6·25″ to 6·8″; bill 2·52″ to 2·87″ (no male above 2·77″); weight 5 oz. to 8 oz." (Hume).

"The irides are dark brown; the legs and feet in adults are dull olive or yellowish green, or greenish or dull pale yellow—in young birds ashy with a greenish tinge; the claws black or brownish black; the terminal one-third of the bill is black or brownish black, the basal portions generally yellowish brown, bluish along commissure, but the upper mandible often has a greenish ashy or plumbeous, or vinous or fleshy tinge, and sometimes is plumbeous everywhere except at the dark tip" (Hume).

Adult female.—Similar to the male.

"Total length 11 inches, culmen 2·8″, wing 6·0″, tail 2·5″, tarsus 1·3″" (Sharpe).

"The sexes do not, judged by my measurements, appear to differ appreciably in size, but the three largest birds measured were females and the two smallest males, so that probably, age for age, if one could make sure of this, the females are the largest" (Hume).

Measurements of the specimens in the Bombay Natural History Society's possession and in the Asiatic Museum together with a few others which have passed through my hands do not shew much variation in size between the male and female. The average

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measurements for both sexes are, Wing 6·41″; Bill from gape 2·76″; Tarsus 1·30.″ The smallest bird, a ♀ from the Indian Museum, has a wing of 6·02″ and the largest, an unsexed bird from the same place, has the wing 6·68″. The bills vary in length between 2·62″ and 3·02″ and the tarsi between 1·12″—that of a curiously short-legged bird—and 1·5.″

The depth of the bill at the extreme base is only ·32″ as against ·5″ in that of the Wood Snipe and the length and slenderness of the bill of the Solitary Snipe is alone sufficient to distinguish it from the other. In general appearance the Solitary Snipe is a far paler coloured bird than any of the other snipe and this difference is even more conspicuous in life than when the bird is made into a skin. In build it is also slighter, its neck longer and it seems to stand higher on its legs, though its tarsus is really no longer than that of the Wood Snipe.

The British Museum has a fine series of this Snipe, over 40 specimens, but of these only 11 are sexed, 7 females and 4 males, and it is hardly safe to generalize as to comparative size of the sexes on such scanty material. It is, however, more than possible that a large series of sexed birds might show that the female Solitary Snipe is bigger than the male, a fact usual, indeed, with most known species of the Genus *Gallinago*. An examination of those species of *Gallinago* of which the British Museum has fairly big series shews the following comparative measurements of males and females :—

	Males.		Females.	
	Bill	Wing	Bill	Wing
Gallinago stenura	2·3	4·9	2·45	5·1
,, *megala*	2·3	5·4	2·6	5·6
,, *major*	2·45	5·55	2·5	5·3
,, *nigrigenis*	2·75	5·1	2·9	5·1
,, *coelestis*	2·8	5·2	2·8	5·3
,, *frenata*	2·8	4·9	2·9	4·7
,, *paraguayae*	2·6	5·0	2·8	5·25

From the above we find that in the species *stenura*, *megala*, and *paraguayae* both culmen and wing are longer in the female than in the male; in *major* and *frenata* the bill is longer but the wing shorter, but of the latter species there are only 4 females sexed

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out of the whole series; in *nigrigenis* the bill is longer and the wing the same and finally, in *coelestis* we have the bill the same and the wing longer in the female.

My own experiences go to shew that both in the case of *stenura* and *coelestis* the female though, perhaps, a less bulky bird, has wing and bill consistently though but slightly longer than it is in the male. At the same time, I have not had sufficient material to work on, as regards the other species, to enable me to assert that such is always the case with birds of this genus.

Distribution.—The Solitary Snipe is found throughout Eastern Asia from Japan as far West as the Altai mountains and as far South as the Himalayas and the Chin Hills extending further South during the Winter into the plains of China and India.

Within the limits of the Indian Empire the Solitary Snipe breeds throughout the Himalayas from Western Kashmir to the extreme East of Assam, both North and South of the Brahmaputra, and thence through the Chin and Shan Hills wherever these are of sufficient elevation. At this season it may be found at all heights between 15,000ft. and 9,000, possibly breeding at rather lower elevation than this as I shot a specimen in May in N. Cachar at 6,000ft. The testes of this bird were much swollen and it was evidently breeding either in the place where shot or in the adjoining Naga Hills which ran some 2,000ft. higher.

As soon as the cold weather sets in the Solitary Snipe moves further South and to lower elevations, but it is in no sense migratory in India as is the Woodcock, seldom leaving the foot hills for the plains and only occurring in the latter as a rare straggler. On September 14th, 1879, Mr. A. Guthree obtained a specimen near Benares and in 1898 Mr. F. W. F. Fletcher and Mr. W. Hamilton shot a bird of this species near Devala in the S. E. Wynaad.

I have records of its occurrence in Cachar (W. Cathcart), Sylhet (St. J. Hickman), Dibrugarh, Chittagong Hill Tracts, Chittagong, N. Cachar, Khasi and Garo Hills, and between October and March it undoubtedly occurs regularly in small numbers all along the foot of the Himalayas throughout the Dooars.

The extent to which the Solitary Snipe is migratory has never been well worked out. In Japan it would appear that it is resi-

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dent throughout the year, perhaps working South during the cold season, but in China it is more truly migratory in its habits, breeding in North-Eastern Siberia and extending well into China in the winter. On the other hand in Turkestan, the Altai and possibly also Tibet the bird is probably only locally migratory to the extent of altering the elevation of its haunts with the varying seasons.

Mr. H. E. Dresser, who has lately been working at this genus, has very kindly sent me *in epistola*, the result of his researches in regard to the destribution of this snipe. He writes:—

"*Gallinago solitaria* breeds on all the mountain ranges of Asia between about 57° and 27° N. lat., also on the Commander Islands, in Kamchatka, Saghalien, Japan, the Corea, North China, Manchuria, Mongolia, Dauria, the Southern half of the Irkutsk, Government, the Bureja and Stanovoi mountains, Sajan, the Altai Tarbagatai, Alatan, and the mountains of Turkestan at an altitude of from 4,000 to 14,000 feet, also in Tibet and the Himalayas. In the autumn and winter it is found near Irkutsk, Krasuojarsk, Ust Kamenogorsk, on the Irtesh at Askabad and in Eastern Persia where Mr. Zarudny obtained it on the 2nd of October 1898 at Neizar in Seistan, on the 19th of October at Tebbess, on the 21st and 22nd of October at Kelata-Marg, on the 23rd of October at Pud-i-Akhangerun, and on the 31st of October at Kerat, all these places being in Seistan. The typical form is found in Turkestan, the Altai, the Altyn-Tag mountains, Zaidan, the Southern Koko-Nor mountains, Nan-shan, Upper Goango, and South-Western Mongolia—the Eastern form *(Gallinago solitaria japonica)* from the Sayans, East to the Commander Islands, and South to Pekin. Some specimens from Krasno Yarsk on the Yenesei are intermediate, whereas others belong to the Eastern form."

The Solitary Snipe is by no means a common bird anywhere within our limits, although Hume says that "in the Himalayas at all seasons it is at least ten times as numerous as the Wood Snipe. It is just as commonly met with in twos and threes as singly, whereas (in the hills at any rate) the Wood Snipe is always solitary." Scully also reported that "the Solitary Snipe is not uncommon in the Valley of Nepal from October

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to the beginning of March, being represented in larger numbers than either the Woodcock or Wood Snipe." As, however, Scully also says that the Woodcock "is not at all common in the Valley and can only be obtained by hard work," we need not infer that the Solitary Snipe occurs in any great numbers.

This bird is in all its ways far more a true snipe than is the Wood Snipe and in flight and voice is very similar to the Fantail and Pintail. On the wing it is strong and quick and it indulges in the same twists and turns as does the Pintail, rising with the same loud "pench" as does that bird, though its voice is shriller and louder, and its flight, perhaps, not so quick.

Hume says "they do not seem to care much for cover. I have constantly seen them along the margins of little streams, in bare rocky ravines and valleys, where there were only small corners and nooks of turf and mossy swamp, and no cover a foot high. I have, no doubt, found them in small open swamps in the middle of jungle, but they stick to the grass and low rushes, and I never observed them in scrub or rinjal jungle. I have known Wood Snipe and the Eastern Solitary Snipe flushed within a short distance of each other; but, as a rule, the Wood Snipe is to be seen only in tiny swamps or morasses, partly or wholly surrounded by thick cover—the Solitary Snipe in little swampy places on open, grassy hill-sides or along the margins of rocky-bedded bare banked streams."

It however does sometimes actually frequent forest land, for one shot by Major Wilson in Shillong was found in grass land more or less covered with pine forest and the breeding male shot by myself in North Cachar was put up out of bracken in oak forest, the trees being quite close together and much matted and covered with orchids and other parasites.

Such records as I have of birds shot along the foot-hills of the Himalayas seem to have been all obtained from grass bordering patches of swamp, situated either at the bottoms of grassy hills or else in comparatively open ravines.

Major Wilson, writing to me about this snipe, says "I have only killed about half a dozen of these in my time and all round about Shillong. I found them in the same sort of ground as the

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ordinary snipe and never in matted grass such as the Wood Snipe inhabits."

"On March the 13th, 1890, when shooting with Mr. W. H. Dobbie, I killed three Solitary Snipes all within a few yards of one another."

Hume found, in the stomachs of those he examined, small insects and tiny grubs, in two or three were found masses of tiny black coleoptera and in one some minute shells. In the one bird I have examined there were numerous tiny shells and what looked like the remains of some grey-coloured caterpillars.

From the formation of the bill of birds of this sub-family one would expect to find them all more or less addicted to boring in the earth for their food. The bills of all Snipes are so constructed that by elevating the end of the maxilla, or upper mandible, they can be opened for about one-third of their length whilst the gape itself is still kept closed. This enables the Snipe to thrust its bill into the soft ground or slush in which it feeds and having found its prey to grasp it without resorting to the great muscular effort which should be necessitated by an attempt to force open the whole bill from gape to tip.

Knowing this fact, an examination of the bill of each species may be found to be some guide to help us to ascertain the food on which it principally subsists, for we shall find the nervous and muscular structure of the bill most developed in those species which resort most to boring in their search for food.

In *Gallinago solitaria* we do not find the retractile muscles and nerves very highly developed and there are not the strong terminal pits which we see in the bill of the Common Snipe and, to a lesser degree, in the Pintail and Woodcock. It is probable, therefore, that the Solitary Snipe feeds principally upon such insects and surface shells, etc., as it can obtain above ground, resorting to boring for worms and similar food only when forced to do so by the absence of any other.

During the breeding season the Solitary Snipe *bleats* or *drums* in much the same manner as does the Fantail. Hume observes: "In May . . . the males are often to be seen and heard in the higher portion of the hills soaring to a considerable height, repeatedly

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uttering a loud, sharp, jerky call, and then descending rapidly with quivering wings and out-spread tail, producing a harsh buzzing sound something like, but shriller and louder than, that produced by the Common Snipe, and this though they do not descend as rapidly as this latter."

The Solitary Snipe is a most excellent bird for the table, though as Hume says, perhaps less so than some other members of the genus.

Nidification.—Gallinago solitaria is known to breed throughout its Indian range at suitable elevations. Hume records: "The breeding season commences in May . . . . . The nest, such as it is, is usually placed on grass or moss, close to some stream, often more or less overhung by some tuft of grass or rushes. It consists at most of a few dead rushes or scraps of dry grass or moss, surrounding or at times lining a little depression in the moss, turf or ground. In one case I was told there was no nest at all, the eggs being laid simply in a circular shallow depression in deep, spongy club moss, apparently merely hollowed by the pressure of the bird's body."

"I have never myself seen a nest, but have this information from natives who have repeatedly seen the eggs, always at places high up on snow-capped ranges, and on snow-fed streams."

"I have never succeeded in securing or even getting a sight of the eggs, though on one occasion several (subsequently unfortunately destroyed) were collected for me in Kashmir."

Oates has shewn however in his "Game Birds," p. 442, that the eggs Mandelli obtained from Sikkim and believed to be those of the Wood Snipe were almost certainly of this species. As regards these eggs, Herr. Otto Möller gave Hume the following details:—

"The eggs were found in Native Sikkim, just opposite Darjeeling. Mandelli several times pointed out to me the spur where they were found, the elevation of which is, I should say, between eight to nine thousand feet. The eggs, eleven in number, were procured during the latter part of June . . . . . but the eggs, though clearly all belonging to the same species, equally clearly belonged to four different nests and the men could not point out the clutch to which the skin belonged."

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Hume describes these eggs as being broad ovals of regular peg top shape with stout compact shells, very faintly glossed. He adds: "The ground is a pale pinky stone colour of varying shades sometimes almost white, sometimes browner, sometimes more decidedly pink, densely and boldly blotched (the blotches often longitudinal in their character and radiating in curved lines from the broad apex) with a rich, at times brownish, maroon, almost black in some spots, browner in some eggs, redder in others, this blotching being generally intermingled with very similarly shaped, subsurface looking pale grey or inky purple patches or clouds."

"In some eggs the markings are almost entirely confined to the upper one-third of the eggs, where they are in places all but confluent. In others the markings, though in such cases often less densely set, extend over the entire upper half of the egg; but as a rule but few markings, and then much reduced in size, extend over the lower half of the egg."

"The eggs, I have measured, varied from 1·66 to 1·76 in length, and from 1·2 to 1·28 in breadth, but the average of 10 eggs is 1·71 by 1·24."

Oates, in describing the eggs of the Solitary Snipe in the Collection of the British Museum, notes that "they are easily distinguished from the eggs of all other snipes in the collection by reason of their pinkish-buff ground colour . . . . . Many of the blotches are streaky and make an angle with the major axis, seeming to be, as it were, twisted round the egg from right to left, when the specimen is viewed with the broad end uppermost."

The Collection contains 3 of Mandelli's eggs, so the above reference to the pinkish ground colour may be considered applicable to those as well as the others and agrees with Hume's own description. The other Solitary Snipe's eggs in the Collection are two clutches from Ta-tran-la, Tibet, and were taken at an elevation of 12,000 ft.

In my own Collection I have a clutch of four eggs from Turkistan and a single egg from Innakul, the latter of which was given me by the Hon'ble Walter Rothschild out of a clutch of four eggs in the Tring Museum. All the eggs have the drab-yellow ground colour and vandyke brown markings of ordinary snipe's eggs with no

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trace of the pink tinge mentioned by Oates and shewn in the plate (III No. 9) in the second Volume of the *Catalogue of Bird's Eggs in the British Museum*. All, however, have the same curious twisted character in the markings.

THE PLATE of the Solitary Snipe is decidedly good. Many birds are considerably paler in general tone than the bird depicted which, indeed, must have been darker than the average, though I have seen specimens even darker than this. The staring white rim round the eye is *not* correct and the colours of the soft parts are not normal. I doubt if any bird ever possessed quite such vivid green legs as these and the greater number have them more a dull yellow-green with a distinctly livid tinge.

The bill is correctly coloured, but that the terminal third should be darker. It must, however, be remembered that though the brown tinge given here is correct for some birds, in many the bill will be found to be coloured a livid green at the base, more especially about the gape.

GALLINAGO NEMORICOLA.

The Wood Snipe.

Scolopax gallinago.—Hodg., Gleanings in Science, iii, p. 240.

Gallinago nemoricola.—Hodg., J. A. S. Bengal, vi, p. 490; Blyth, Cat., p. 272; Jerdon, B. of India, iii, p. 672; Hume and Davidson, Str. F., vi, p. 459; Hume Cat. No. 868; Hume Str. F., viii, p. 112; Legge, B. of Ceylon, p. 814; Hume and Marshall, Game Birds of India, iii, p. 325; Butler Str. F., ix, p. 428; Reid, Str. F., x, p. 68; Ditmas, *ibid*, p. 173; Oates, B. of B. ii, p. 385; Barnes, B. of Bombay, p. 344; Davison, Str. F., x, p. 413; Hume, *ibid* xi, p. 318; Oates, Hume's Nests and Eggs Ind. B., iii, p. 350; Sharpe, Cat. B. M., xxiv, p. 657; Oates, Cat. Eggs B. M, ii, p. 64; Sharpe, Hand List of B. of B. M., i, p. 166; Blanford, Aviffauna of B. I., iv, p. 285; Oates, Game B. of In., i, p. 439; Finn, Indian Waders, p. 141.

Scolopax nemoricola.—Jerd., Ill., Ind. Orni., pl. ix; Nevill, J. A. S. B. (Ceylon), 1867-70, p. 138; Seebohm, Geogr. Distr. Churadridæ, p. 474.

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Description.—Adult male.—Forehead brown, changing to black on the crown and nape; a rufous median stripe; supercilium and sides of the head white, fulvous white or pale fulvous, speckled with brown and with broad brown bands running from the bores and from under the ear coverts to the nape. Chin white, generally unspeckled, sometimes faintly dotted with brown. Upper back and scapulars velvety black, the former near the nape much marked with rufous and the latter broadly edged with the same; lower back and rump duller black with rufous bars, more or less whitish in front on the former; upper tail coverts barred rufous and blackish brown, the former colour predominating. Central tail feathers black with two rufous bars and tips, the subterminal bars very broad; outer tail feathers barred dull white and black. Breast fulvous, or fulvous white barred brown, remainder of lower parts, *including the abdomen*, white barred closely with brown and with the undertail coverts generally strongly tinged with rufous. Auxillaries and underwing coverts dark brown with narrow white bars. Wings brown, the coverts edged and barred with fulvous, the primaries and primary coverts tipped with a pale edging, inner secondaries barred throughout with fulvous or fulvous rufous.

Irides dark brown, bill horny brown, more or less tinged with green, the tip darker and the basal two-thirds of the lower mandible yellowish; legs dark plumbeous green.

Wing 5·25″ to 5·75″; bill from gape 2·4″ to 2·65″; tarsus 1·2″ to 1·5″.

Eliminating the largest and the smallest birds the tarsus only varies between 1·3″ and 1·4″ and the extremes both ways are probably abnormal.

Adult female.—Does not differ from the male and is probably about the same in size or very little bigger, though with a longer bill. The two longest bills I have personally measured were 2·60″ and 2·65″ and both belonged to female birds.

Young bird.—Judging from a single specimen of a young bird in the Indian Museum with a wing of 5·02″ and a bill of 2·38″ it would appear that in young birds the darker colours predominate over the paler more than in the adult. The dark bars on the lower plumage are distinctly broader and more close together, and

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the whole appearance in this specimen is far darker than I have seen in any adult bird.

Sharpe does not differentiate between the male and female, but the average measurements of the British Museum birds, including both sexes, are bigger than those I have handled. In the former the wing is given as 5·7″ and the culmen as 2·65″.

The depth of the bill in those I have measured averages about ·5″, the heavy base being very conspicuous when compared with other Snipe.

The sportsmen will generally be able to recognise the Wood Snipe by its comparatively dark plumage and rather squat heavy shape and beak.

"Length 11·0″ to 12·5″; expanse 18″ to 19·75″; wing 5·4″ to 5·7″; tail from vent 2·5″ to 2·9″; tarsus 1·41″ to 1·49″; bill from gape 2·41″ to 2·62″; weight 4·9″ to 6·1″ oz." (Hume).

Jerdon gives the weight as up to 7 oz. and Hodgson, amongst some 20 birds weighed, obtained one of 6·75 oz.

"The irides are hazel to deep brown; the front of the legs and toes are grey, sometimes, perhaps commonly, bluish, sometimes more plumbeous or slaty and sometimes again with a drabby shade, or again greenish, and generally everywhere paler in the female, the back of the legs and soles fleshy, sometimes pinky, sometimes bluish or dusky; the claws horny brown to almost black; of the bill nearly the terminal one-third is brown to blackish brown; the basal two-thirds much paler and with a tinge sometimes reddish fleshy, sometimes yellowish fleshy, sometimes livid, sometimes drab" (Hume).

Distribution.—Blanford thus defines the distribution of the Wood Snipe within our limits, outside of which it has not yet been obtained. "In the Himalayas as far as Dalhousie to the westward and Sikkim to the east, and probably further in the latter direction; also in the hills south of Assam and in Manipur occasionally in Burmah even as far south as Tenasserim, and as a winter visitor only, in the hills of Southern India—Coorg, Wynaad, Nilgiris, Anaimalais, Shevroys and probably others. In one case this species is said to have been recognised in Ceylon. A very few specimens have been obtained whilst migrating, one at

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Calcutta by Blyth, two at Russelkonda by Macmaster, one in Serguja by Bull, and probable occurrences have been recorded at Nasik and Dharwar."

The Wood Snipe extends all along the Himalayas from the Eastern point mentioned by Blanford, and I have had either records of its occurrence or specimens sent me from the Dooars, Buxa, Jalpaiguri, Barpeta (South of Bhutan) and Tezpur (South of the Dafla Hills), Cachar, Sylhet and Myitkyina (Capt. Clifford), thus linking up its range almost from point to point.*

As regards these birds' visits to the Southern Hills these are, no doubt, more or less the result of a migratory movement but as we get to know more about this rare Snipe it will probably be found that its migrations are of a very local character and it would not surprise me to find that over the greater portion of its habitat it is a permanent resident. The dates on which specimens of the Wood Snipe have been obtained, for me, shew that in some cases it is not a bird of high elevations alone and that it almost certainly breeds well below 2,000 feet.

From Jalpai I have received a bird shot in May in the swamps at the foot of the Hills; my father, E. B. Baker, shot several specimens in Purnea and Maldah in April and May whilst returning from Tiger shoots, and Major Wilson records his seeing many of these Snipes in May in Manipur at about 2,000 feet elevation. It is quite possible that if we knew the haunts of this Snipe and if we could visit them at the proper season we should not find them nearly as uncommon as they have been hitherto considered.

Damant said that he found it common in Manipur and that one morning he killed five shooting in long grass from the back of an elephant.

Baldwin also came upon a number together when shooting in the Philibet district in January 1872. He writes:—"I came across not one, but over a dozen of these birds; they were close to one another . . . . . we soon put up several Common Snipes and presently my companion fired at one, and I then saw a large dark bird, which I thought at the time was a Solitary Snipe, rise up with a croak, and after curving about, drop close by. We went

* There is in the Society's collection a specimen of a Wood Snipe (in spirit) shot at Thana, near Bombay, by Mr. Thos. H. Moore in January, 1896.—Eds.

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up and not one, but three rose—two of which fell to our shots. We soon found several more and nine were killed altogether; they offered the easiest of shots, and did not rise until the elephants were close on them. They were particularly fine gamey birds and proved most excellent for the table."

Major Wilson has been good enough to send me copies of his notes on this bird as found in Manipur and these I quote *in extenso*.

"The only time I ever made what may be called anything like a bag of Wood Snipe was in the year 1896, close to Manipur. I was sent out into cholera-camp in May and while there discovered a valley about 4 miles from our final camp, which seemed absolutely crawling with Black Partridges and where also I saw many Wood Snipes. The Gurkha, as is well known, is an extremely keen shikari, and unfortunately one regardless of the breeding season. I accordingly issued orders that no one was to fire a shot in this valley, till I could shoot it myself. In October of the same year I managed to get away. The following is a copy of an entry in my shooting diary:—

"October 1, 1896.—Went over to the Choonbutti (there was an old Manipuri lime kiln, near which we camped, in my reserved valley) with H—of my Regiment, we did not find nearly so many partridges as I expected, and the grass was very heavy, still we killed fifteen brace of black partridges, five and-a-half couple of Snipe, of which two and-a-half couple were Wood Snipe, and one quail. The grass was so stiff the dogs rubbed their noses sore.

"October 2.—Twenty-two and-a-half brace of partridges, eight and-a-half couple of Snipe, of which four couple were Wood Snipe.

"We could have killed a good many more Wood Snipe had we troubled to go after them, but if a bird flew out of the line we were beating, we never followed it up, as we wanted to make a really good bag of partridges.

"These birds were all lying in heavy grass up to our knees.

"I think the name of this bird somewhat of a misnomer because out of those I have shot, a fair number, I have never once flushed one in a wood, though once I flushed one in a jheel in the midst of tree jungles and he pitched in the forest and I killed him there.

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"The Wood Snipe lies in covert which is too thick for the ordinary Snipe to run about in and he also sometimes favours very high grass. The places he seems to like best are valleys in the hills which are full of thick matted grass growing on the sites of old rice khets.

"He lies very close and is consequently rather difficult to flush even with a dog and when flushed flies heavily, and seldom goes more than a couple of hundred yards.

"Occasionally when flushed he utters a croaking note, which sounds like 'Tok-Tok'."

The Wood Snipe obtained by my father in Purnea and Maldah were shot by him in 1882 in company with Mr. J. Shillingford, Mr. G. Hennessy and others during a couple of tiger shoots held in April and May in the two districts.

My father told me that one day late in April when coming back from a successful tiger shoot in Maldah the line was engaged in shooting anything that might get up before the elephants as they wended their way home to camp. In this way a few hog deer and various birds were added to the bag, and whilst going past a number of tiny swamps covered with dense sungrass, one of the line put up and dropped a bird; he thought to be a Woodcock. On search being made for this, several more were put up and a good many shot, my father himself securing four. Further on the same evening whilst working through similar places others were disturbed and two more shot and on following days yet others were brought to bag.

The same year and in the succeeding month, May, whilst shooting in Purnea, a similar experience was met with and more of these birds killed. I cannot now remember what was the actual number brought to bag, but from what my father told me they must have been fairly numerous, especially in Maldah.

He described the birds as being very slow and *owlish* in their flight. They rose with a low croaking cry, flattered heavily over the grass and ekra in a fitful and undecided manner and then flopped into cover again before they had covered a hundred yards.

The Wood Snipe, not only in appearance but in flight and habits, is far more like the Woodcock than is the Solitary Snipe-

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It may not perhaps haunt forest and brake as does the Woodcock, but on the other hand it is never found in the short grass and open swamps frequented by the Solitary Snipe. Its favourite haunts seem to be those described above by Major Wilson or, when in the plains, huge fields of dense sungrass, ekra or elephant grass which have in their midst small pools and swamps hidden away by the rank vegetation. In Maldah and Purnea they were found in tiny pools only a few yards across, which were covered with coarse weeds and grass so high and dense that they would have been unworkable except from elephants.

In flight, as may be seen from the descriptions already given, it closely resembles the Woodcock and is, perhaps, even slower. It pursues the same wavering, bat-like course in its mode of progression, makes the same unlooked-for darts to one side or the other and finally has the same headlong tumble into cover, giving one the idea that it has died suddenly and fallen to earth.

It is, however, a very shy retiring bird and never, like the Woodcock, frequents the haunts of men. This shyness and also the unhealthiness of its habitat along the Terai will probably always prevent us learning very much about it.

Nidification.—There is nothing on record about the nidification of the Wood Snipe at present except in connection with the eggs obtained by Mandelli in Sikkim. Three of these eggs are in the British Museum, but one of them is marked "869 *Gallinago solitaria*, Native Sikkim, 18-6-79" and, as Oates remarks, it seems possible that Mandelli's reputed eggs of the Wood Snipe were afterwards discovered to be the eggs of the Solitary Snipe, probably by the identification of a skin.

At the same time it must be noted that Hume distinctly states that when Mandelli's collectors brought in these eggs they brought in with them the skin of a Wood Snipe. The date and name on the eggs, however, would seem to shew that this skin afterwards proved to be that of a Solitary Snipe.

My own experience, meagre as it is, as regards their nidification, would appear to confirm Oates' opinion. On the 11th June 1908, one of my Khasia collectors brought in to me a Wood Snipe together with a single egg and some fine tangled grass, which he

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said had composed the nest and which was clogged and matted with the contents of other eggs which had been broken by the trapped bird. Unfortunately the egg, which was saved, is undoubtedly an abnormally small one, and my collector informed me that when he set the nooses for the bird he saw that there were three big and one much smaller egg, but that in colouration they were all alike.

The single egg measures only 1·5″ × 1·04″ and is much like many eggs I have seen of *Gallinago cœlestis*, but is unusually brown in tint. The ground is a pale stone colour and the markings consist of heavy blotchings of vandyke brown with a few underlying ones of grey or lavender. The smaller half of the egg is but very sparsely marked, but on the larger third the blotches form a deep dark ring, inside which again the markings are numerous but not confluent.

The texture is fine and smooth with a faint gloss and the shape is the ordinary sub-pyriform shape of most Snipes' eggs.

Hume, writing of the breeding of this snipe, writes :—"That they breed in the Himalayas between elevations of about seven and ten thousand feet (and perhaps, though I doubt it, considerably higher) is certain. That they begin to lay early too is probable. Hodgson notes that on the 10th March the eggs in the ovary of a female were swelling, and another shot early in April contained a nearly full-sized but unshelled egg. But no European, I believe, has ever yet taken the nest, though Mr. A. G. Young writes that he *knows* they *do* breed in Kulu."

It is more than probable that we shall eventually find that the Wood Snipe breeds at far lower altitudes than 7,000 feet. My own nest was taken near Shillong at under 4,000 feet, and in Manipur it is almost certain that they breed at but little over 2,000 feet, whilst it also seems possible that they are permanent residents at the foot of the Himalayas throughout the Dooars.

THE PLATE of the Wood Snipe is excellent, both in colouration and attitude. In many birds the bill has a faint green tinge about the base but normally, I think, the colour is much the same as that shewn, though perhaps not quite so clear and hard as here depicted.

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The legs and feet are very well coloured, but the colouration varies much and is often just as distinctly greenish as they are here shewn bluish.

The attitudes of the birds in this plate and that of the Solitary Snipe show well the characteristics of the two species; the active, quick moving character of the Solitary Snipe, as compared with the heavy, slow disposition of the Wood Snipe.

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THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA
(INCLUDING THOSE MET WITH IN THE HILL STATIONS OF THE BOMBAY PRESIDENCY).

BY

T. R. BELL, I.F.S.

Part VIII.

(Continued from page 879 of Volume XIX.)

58. Vanessa cardui, *Linn.*—(Plate B, fig. 9 ♂). Male and female *upperside*: forewing: interspace 1 and extreme base of wing dusky-black, irrorated with golden scales; apical half of wing and termen dusky-black; discal and medial area of wing ochraceous orange with the following black markings: an irregular oblique band consisting of two detached spots across middle of cell, a patch in base of interspace 2 and a curved transverse bar across interspace 1; on the black apical area an obliquely placed series of three quadrate white spots from costa followed by a curved transverse series of four white spots and on the broad dusky-black terminal margin an obscure transverse series of pale, slender, lunular marks. Hindwing dusky-brown covered with long, silky, brown hairs at base; a large spot beyond apex of cell, a broad, transverse, discal, irregular band and the termen ochraceous orange; the ochraceous discal band does not extend to the costa and bears a round black spot in each of the interspaces 2-6; on the termen there is an inner transverse series of black lunules and an outer series of black spots at the apices of the veins. *Underside*: forewing, cell and discal area from vein 1 irregularly to vein 4 ochraceous orange, rest of the wing greyish brown; base of cell red, apical portion white, black marking in and below cell much as on the upperside; beyond the cell the white markings on the apical area and on the termen as on the upperside. Hindwing mottled with olive-brown and ochraceous, the olive-brown markings with slender white margins; a postdiscal transverse series of ocelli in interspaces 2-6, those in interspaces 3 and 4 with blue, the rest with black centres; all with inner rings of ochraceous and outer rings of black; a series of black subterminal lunules and terminal black spots as on the upperside but not so distinct. Antennæ brown, ochraceous yellow at the apex; head, thorax and abdomen with ochraceous pubescence, the thorax beneath the pubescence metallic green; on the underside the palpi, thorax and abdomen pale ochraceous white. Exp. 58-68 mm.

Larva.—The larva is the type of *Junonia* larvæ. Head parallel-sided, flat-faced, with distinct central depressed line; covered with erect, rather long, white setæ which are shortest on the face; a few brown tubercles on vertex of each lobe bearing black setæ; colour from light red-brown to

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black. Segment 2 slightly smaller than the head with a double row of numerous erect, long, white hairs as a collar and two bunches of similar hairs in front of each spiracle. Segments 3 and 4 have a subdorsal and lateral branched spine, or a pedicel with spinules. Segments 13 and 14 have only the lateral pedicel. The dorsal spines of the segments 5-12 are nearer the front margin than the others. The usual little spines on leg-bases (for disposition of all these pedicels see *Junonia* of any species). Spiracles oval, large, black. Body surface velvety, covered densely with longish white hairs. All spines or pedicels arise from a more or less deeply rose-coloured, truncated, conical tubercle. Ventrum slightly hairy. Colour of body bright yellow smudged and spotted black to a varying degree, sometimes so much as to be completely black; always a broad marginal yellow band and a double yellow dorsal line; spines are translucent white, the spinules black. L: 40 mm.; B: 5·5 mm.

Pupa.—Is of the *Junonia* type but slender. Head and segment 2 to base of shoulder-point quite square seen from above, blunt in front where the margin is slightly concave between the eyes; there is a slight carination over each eye reaching back to front margin of segment 2, these carinations converging backwards. Dorsal line of the head, segment 2 and thorax in one plane: at 45° to the longitudinal axis of pupa as far as apex of the last, the descent from it to segment 5 over segment 4 short; both segment 2 and thorax convex transversely to length of pupa, the former not broad between its margins, the latter carinated lowly from front margin to apex where the carination ends in a low triangular pyramid. Constriction behind thorax slight dorsally, slighter laterally. Abdomen dorsally somewhat convex from segment 5 to cremaster, circular in transverse section; ventral line straight, somewhat bulged along wing-junction-line. Wings expanded slightly laterally from a small shoulder-point in a concave line very shortly to a second point immediately behind and opposite segment margin 3-4, after which the expansion gradually narrows to lose itself in body-surface at segment 6-7. Cremaster ordinary, oblong in shape, rounded at extremity with rather strong ventral and slight dorsal extensor ridges. Spiracular expansions of segment 2 indicated by a flush, longly oval, grey surface on front margin of segment 3 on each side; the other spiracles longly oval, of ordinary size, flush, brown. Surface of pupa finely and superficially corrugated-rugose; segments 6-13 have a minute dorsal, pointed tubercle; segments 8-12 a still smaller supra- and subspiracular point; segments 4-12 a small, conical conspicuous, subdorsal point, those on segments 7-10 being slightly largest. Colour of pupa is variable, green and gold in some cases, gold in others, pink-brown and gold again in some, the gold being always strongly developed dorsally and on the points. L: 23·5 mm; B: 8·25 mm. at shoulders; the height is equal at apex of thorax and at segment-margin 7-8.

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Habits.—The imago lays single eggs on the young shoots of the foodplant. The larva, after emerging from the egg, makes a hiding place amongst the young leaves by drawing them together with silks; when larger, from the third moult onwards, it makes a cell at the point of a leaf with a lot of untidy web, eating the same leaf the cell is on. It lies with its head turned round on its side when at rest and shams death when disturbed, falling to the ground when possible. The pupa is fixed to a horizontal or vertical surface, hanging perpendicularly down, the suspension free but firm. The insect is our English "Painted Lady" and is found all over India, most plentifully in the hills, though it exists in great numbers in certain years also in the plains. It is a quick, strong flier and at times goes long distances. Generally, however, it takes short flights, rising from the ground to rest again a short distance off. It nearly always sits with its wings closed and often draws the front wings into the hinder ones, leaving just the costa and apical part visible. The underside is so designed as to harmonise perfectly with gravelly, sparsely grass or herb-covered soil which it nearly always affects and, once settled, it is difficult to see. It frequents flowers, generally preferring those of creeping, low plants and, when feeding thus, it holds the wings half open; also when basking in the sun. The distribution of the insect is all but worldwide; it has been found in all parts of India, Ceylon, Assam, Burma and Tenasserim. The foodplants of the caterpillar in England are thistles, upon one species of which it has been bred in Kashmir also; Mallow, Burdock, Viper's Bugloss, and Nettles even, belonging to the botanical families *Compositæ* (*Carduus*, Thistle and *Arctium Lappa*, Burdock), *Malvaceæ* (*Malva*, Mallow), *Boragineæ* (*Echium*, Viper's Bugloss), *Urticaceæ* (*Urtica*, Nettle) are eaten at home in England; in Kanara, here in Bombay, the larva has been found on *Zornia diphylla* of the *Leguminoseæ* and the compositaceous *Blumea*. By which it will be seen that there is no limit to the distribution arising from the want of things to feed on. The butterfly has been found in great numbers in the Sind deserts as well as in the dense forests of Kanara, though in the latter it is really plentiful only in certain years.

59. Vanessa indica, *Herbst.*—Male and female resemble *V. cardui*, but the

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ground-colour is darker both on the upper and under sides and the orange markings deeper and richer in tint. Dfliers also as follows:—*Upperside* forewing: the ochraceous red on disc and across cell proportionately of less extent and uniform, not getting paler towards apex of cell; the upper four spots of the preapical series on the black apical area minute. Hindwing: the postdiscal transverse band much narrower and shorter, not extending below vein 1, margined inwardly by a series of broad, black, subcrescentic marks; the tornal angle with a small patch of violet scales bordered inwardly by a short, thick, black, transverse line. *Underside* very much darker than in *V. cardui*, the orange-red on disc and cell of forewing restricted as on upperside; three small, transversely-placed, blue spots beyond the cell. Hindwing: the mottling comparatively very dark, purplish black with slender white margins, shaded on disc with rich dark olive-brown; the postdiscal series of ocelli dark and somewhat obscure; an inner, subterminal, transverse series of blue and an outer, very much slenderer, transverse series of black lunules. Cilia of both fore and hindwings white, alternated with brown. Antennæ black, tipped with pale ochraceous; head, thorax and abdomen with dark olive-brown pubescence; beneath, the palpi, thorax and abdomen pale ochraceous brown. *Exp.* 58-70 mm.

This butterfly has not been bred as far as is known. It is a very close relation of our English Red Admiral, differing only in the greater irregularity of the orange markings on the upperside. It is not really a butterfly that ought to have been mentioned in these papers but, on second thought, it was thought advisable to include it because it has such a wide range in India. It hardly ever occurs in the plains and certainly never breeds there; it is found generally above 2,000 feet in the hills: the Himalayas, the Nilgiris, &c., but not, as far as has yet been ascertained, anywhere in the Western Ghats from Thana to Kanara in the Bombay Presidency. The butterfly extends to Southern Europe and the Canaries, eastwards to China, Japan and the Malay Peninsula.

The following is a description of the larva, pupa and habits of the Red Admiral or *Vanessa atalanta*, which will probably be similar to those of the above.

Larva.—The larva is of the typical nymphaline sort, all spines of equal length, branched on all segments except head and segment 2, where they are much shorter and simple; body cylindrical with anal end sloping, the anal flap triangular with somewhat tumid end or point. Segment 12 is somewhat triangularly produced back in the dorsal line. Head heart-shaped, flat-faced, somewhat bi-lobed, shiny, bronze-black covered with light hair-bearing ochraceous tubercles; ten short, cylindrical, blunt, simple spines round margin of face with four more in a row in front; two slightly larger lower down, subdorsal, one on each side of clypeus apex; antennal

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basal joint ochreous, the other two black; eyes prominent, black; labrum black. Clypeus large, triangular, not very distinct. Segment 2 the same breadth or somewhat broader than head but not so high, with a row of eight simple, short, triangular, black teeth or tubercles from spiracle to spiracle, and a simple, cylindrical, short, spine underneath spiracle; on segments 3 and 4 this simple spine is present in the same position and, besides, a subdorsal and lateral black spine, pointed and set with fine hair-like spinules directed out and upwards, also black. Segments 13 and 14, the former segment being short, have each a dorsolateral similar watery-ochraceous spine, situated near the hinder margins. Segments 5-12 have each a dorsal, subdorsal, supraspiracular and subspiracular similar spine, all more or less ochraceous and set with black spinules, all except the subspiracular spines on segments 3-9 being surrounded at the base with orange somewhat broadly. Spiracles shiny black, oval, of usual size. Surface of body set all over with very minute, white, depressed tubercles, each bearing a fine, white short hair; spiracular region rather more thickly white haired. Colour of larva black, speckled yellow all over—or yellow speckled all over black with a broad yellow subspiracular band from segment 5 to segment 12 interrupted broadly by the tubercles; belly dark; legs black. The subspiracular spines are somewhat shorter than others, those on segments 3 and 4 being, perhaps, just a little stronger than any. L: 35 mm. stretched; B: 6 mm. without spines, 9 mm. with them.

Pupa.—The pupa is of the usual *Vanessa* type, *i.e.*, when seen from above the lateral outline is as follows: head parallel-sided, the front concave with the head-points short, broad and blunt; breadth of pupa increasing somewhat suddenly to a sharp tooth at shoulder; then concave to another similar tooth in a line with apex of thorax, where the breadth of pupa is very much the same; then concave again, but very shallowly, to segment 7-8, where the wings are slightly bulged and the pupa is not so broad; then decreasing in a straight line to the strong, truncated-triangular cremaster with slight dorsal and strong ventral extensor-ridges, the clasper-scar being a double circle inside the latter. The dorsal outline seen from the side is: head and vertex, segment 2, both short, the front slope of thorax at an angle of 45° to the longitudinal axis; the thorax is carinated in dorsal line strongly, ending in a small triangular pyramid just before hinder margin to which the fall is nearly perpendicular, segment 4 being inclined at 45° towards segment 5 which is parallel to longitudinal axis and forms the bottom of the considerable dorsal constriction; the dorsal line again rises in segment 6, very slightly in 7, whence it is strongly curved down to end. Ventral line slightly bulged out towards centre though fairly straight from head to segment 11, after which, bent down. Surface of pupa smooth in the main, with an irregular net-work of thin, slightly impressed lines all over, the antennæ ringed, the proboscis slightly longer than wings;

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there is a slight carination from each head-point to the dorsal carination of thorax at hinder margin of segment 2 and another from apex of this latter carination to hinder margin of thorax laterally; there is a lateral, small, conical, pointed tubercle centrally on segments 3-12, slight on segments 5 and 12, strongest on 7, 8, 9; signs of dorsal similar tubercles on segments 5-12; hardly a vestige of the supra or subspiracular ones. Spiracles of segment 2 mere red-brown slits; the rest oval, colour of pupa slightly convex, with red-brown, narrowly oval centres. The abdomen is somewhat laterally compressed; the lateral constriction is much slighter than dorsal. Colour is a light violet grey-brown with golden reflexions; each tubercle being touched with gold, the dorsal ones surrounded with gold on the abdomen, the lateral one on thorax also and on segments 4, 6, 8, those on 3 and 8 largely; the golden reflexion on the wings is greenish and subcutaneous in appearance. L: 21 mm.; B at shoulder-points: 8 mm.; 4·5 mm. at head; 7 mm. at segment 8; H. at segment 8: 8 mm.

Habits.—Egg laid underneath point of leaf, larva makes a little untidy web-cell by turning over point; continues this in after stages, but of course has to use whole leaves later on; uses much web; lies generally on the upper surface of the chamber thus made and very generally curled round with its head on its side and the body contracted to appear thicker and shorter than it really is. Pupates in a dark corner, if possible, either against a perpendicular surface or from a horizontal one, the attachment being free but firm. Butterfly is fond of the sun, perches and basks on the ground with wings fairly widely open, is fond of sucking at flowers, rotten fruits, &c.; can fly well and rapidly and takes long flights; rests with wings closed, the front wings sunk within the hinder. The place chosen for ovipositing is generally in a sunny place along a wall or hedge or ditch. The larvæ are somewhat liable to be parasitised by ichneumons. The food plants are nettles (*Urtica.*)

Bingham enumerates twelve species of the genus *Vanessa* as inhabiting British India, besides two races and one variety. Some of them are very like the Tortoise-shells at home, others like the Comma. The genus is world-wide in its distribution, existing in both hemispheres, and the majority are palæarctic and nearctic, only a few species extending to the Tropics. The majority of the Indian species are found in the Himalayas and along the northern limits of British India. All feed in the larval stage on nettles,

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willows, poplars, some *Saxifragaceæ* (Gooseberry and Currant), the Painted Lady on Thistles and other *Compositæ*, *Leguminoseæ*, *Malvaceæ*, &c. The type of the genus is the Red Admiral.

60. Hypolimnas bolina, *Linn.* [Pl. B., fig. 7 ♂, 7*a* ♀]—*Wet-season form.*—Male *upperside* velvety black. Forewing: an oval shining irridescent blue patch, broadly centred with white and traversed by the black veins obliquely crossing interspaces 3, 4, 5; two preapical, obliquely-placed, elongate, white spots and a postdiscal, inwardly-curved, transverse series of minute white dots. Hindwing: a central, oval, shining, irridescent blue patch, broadly centred with white and traversed by the black veins as on the forewing, but larger; a postdiscal series of minute white dots, in continuation of that on the forewing. Fore and hindwings: cilia white, alternated with black. *Underside* deep purplish brown. Forewing: some minute white flecks on and just below basal half of costal margin, with a row of three or four larger spots below them, an oblique discal series of three very slender streaks and elongate oval spots from costa to interspace 3, two preapical white spots continued as a postdiscal transverse row of white spots as on upperside, followed by an inner and an outer transverse subterminal series of lunular white marks and a terminal dark line. The series of lunular white marks sometimes complete but generally well defined only below vein 5. Hindwing: a tolerably broad, discal, white band traversed by the black veins; a postdiscal transverse series of minute white dots in continuation of that on the forewing; an inner subterminal series of elongate whitish markings and an outer subterminal slender, white, lunular, broad line, followed by a terminal dark line. Antennæ, head, thorax and abdomen black; beneath, the palpi, thorax and abdomen dark purplish brown.

Female *upperside* dark velvety brown, paling towards the outer margins. Forewing: three or four irridescent blue spots from base of cell along and just below costa to before the middle, from the middle of costa an oblique series of rich irridescent blue marks to interspace 3; a postdiscal, sinuous, transverse series of white spots, an inner subterminal series of short transverse white, narrow markings in the interspaces and an outer subterminal series of white lunules. Hindwing: a postdiscal transverse series of white spots followed by a series of double cone-shaped white marks, one in each interspace, and an outer subterminal series of white lunules. *Underside* dull brown. Forewing: minute white flecks on, and one or two white spots just below basal half of costal margin; an oblique discal series of spots, two preapical spots, a postdiscal transverse series of spots, an inner subterminal series of somewhat cone-shaped marks and an outer subterminal series of lunules white, often sullied with yellowish. Hindwing as on upperside but with the addition of a very broad discal, somewhat diffuse and obscure, whitish, transverse band and the cone-shaped inner subterminal

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white markings of the upperside more continuous, separated only by the slender brown veins. Antennæ, head, thorax and abdomen as in male.

Dry season form.—Male and female similar to the male and female of the wet-season form but with the following differences:—larger; the irridescent blue patches proportionately larger; the hindwing in the male with, on the upperside, a more or less well-marked subterminal highly sinuous pale line; the forewing in the female with, on the upperside, one or two irridescent blue spots just below basal half of the costa; the inner subterminal transverse line of white markings much broader, each emerginate on the inner side. *Underside*: male: ground-colour hair-brown; basal half of forewing dark brown. Hindwing: the discal band and inner subterminal markings broader, diffuse and irrorated with dusky scales.—Female: hindwing entirely without the transverse broad, discal, whitish band, or sometimes this band represented only by a pale shading. Exp. Male: 52-96 mm.; female: 62-114 mm.

This is a variable insect.—Male: the blue patch on the upperside of the hindwing is sometimes in both seasonal forms entirely devoid of the pale centering, and, in the "dry season" form, specimens occasionally occur in which the inner and outer subterminal markings on upperside of hindwing are just as prominently developed as in the female, but they are then always nearly pure white. Female: the discal oblique irridescent blue spots on the upperside of the forewing in both seasonal forms occasionally reduced to one spot. The underside in both seasonal forms is also variable as to the presence or absence of the discal white band and subterminal white markings on the forewing, these latter are often much reduced in size.

In the above description the forms are alluded to as "wet" and "dry" by Colonel Bingham. This is not really quite correct. The size and brilliance and depth of colour depend more upon the plenty and succulence of the food-plants than upon the actual state of the atmosphere. It is in the wet season that the weeds upon which the larvæ feed are most numerous, and, generally, from the middle to the end of the period, that is, from the end of July onwards to, say, in low-lying damp situations, the end of December or even later. During the rest of the year to well on into the monsoon, the herbaceous growth is poor and sparse. So it comes about that the larva of the so-called "wet" form is not so well nourished as that of the later one and produces consequently a smaller and less brilliantly coloured imago. It would thus appear that instead of "wet" and "dry" seasonal forms, it would be more accurate to speak of, say, "starved" and "well-fed" seasonal insects.

The pictures of the male and female in the coloured Plate B are, on the whole, very good, except that, in the male, the postdiscal series of minute white dots on the upperside of forewing is absent. The dots are invariably present in the butterfly. The tone of the ground-colour in both figures is

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reddish; there should be no red in it. This tint is particularly strong in the figure of the female and especially on the underside. The blue irridescence is wonderfully well reproduced.

Egg.—Is nearly spherical, broadest at a third of height from base. There are 10 thin, high, distinct meridional ridges from base which lose themselves on the vertex where there is a round, smooth, shiny space. Colour is glassy green. The egg is very small for the size of the insect. Breadth 0·6 mm; height very nearly the same.

Larva.—The larva is spined, has a cylindrical black body with greyish satiny marbling; the head has two long horns, these horns being generally black, while the rest of the head is yellow. Head is heart-shaped, the face is very slightly convex in centre and is broadest across apex; on the vertex of each lobe is an erect, spinous, hard process or horn in the same plane as the face and diverging one from the other, separated somewhat narrowly at bases by a triangular sinus; the top of each horn is more coarsely and densely spined than the stems, where the little spines are sharp and thickened at the bases; the colour of head is brown-yellowish and shiny with a round black spot at the base of each cheek; the horns are generally black. Segment 2 is nearly as broad as the head. The body is cylindrical, constricted at the segment-margins somewhat, perpendicular and high at anal end which is rounded. Spiracles are oval, black and rather large. Surface of the body is velvety looking; there are the following spines: on segment 2: a central row of 8 small simple spinous hairs, four on each side of dorsal line, and 2 antespiracular, spinous processes one below the other, the lower being the larger of the two, though both are small; segments 3 and 4: a large subdorsal and lateral spinous process and 2 small subspiracular ones both on the same level, one behind the other, and half the size of the others; segments 5 to 11 have each a dorsal, subdorsal, supraspiracular and subspiracular spinous process as well as 2 small ones below the last, one below the other on segments 5 and 11, both at the same level on segments 7 to 10 and a triangle of 3 on segment 6; segment 12: 2 large dorsal spinous processes, one near front margin, one near hinder margin, a subdorsal one, a supraspiracular one somewhat nearer the front margin, and a subspiracular one as well as a single small one underneath the last; segment 13 has a single lateral process and the anal flap has one on the margin about middle. The colour of the body is velvety black indistinctly marbled with satiny greyish; the neck or front part of segment 2 is orange; latter half of anal flap is dirty brown as well as prolegs and true legs; all spinous processes are dirty light reddish-yellow in colour. The processes are about equal in length to each other throughout, except the small ones above mentioned, which are much smaller. L: 57 mm.; B: 5 mm.; L of head-horns: 3·5 mm.; L of spinous processes: 3 mm.

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Pupa.—It is a thick, stout pupa, as broad at the shoulders as at segment 7-8, where it is nearly quite circular in transverse section; the thorax at its highest point is as high as the abdomen at segment 7-8; constriction behind thorax is dorsally pronounced but wide and gradual laterally. Head is thick, square and short, not visibly separated from segment 2, and has a small, rounded, flat-edged projection on each eye pointing forwards. Segments 2 and 3 and head are all in one piece so to speak. Thorax is high, carinated in dorsal line somewhat on front slope, the shoulder produced into two stout short points. Wings somewhat expanded laterally from shoulders to constriction. Transverse section of abdomen circular, the last five segments contracted a good deal, especially ventrally, so that the last segment and cremaster are nearly at right angles to the longitudinal axis of the pupa. Cremaster large, stout, triangular, flattened above and below with the suspensory hairs or hooklets at the very extremity. Spiracles blackish, shiny, oval, convex. Surface of body is rough; there is a conical lateral tubercle on thorax, a dorsal row of 6 sharply conical tubercles on segments 6-11, one to each segment; a subdorsal row of similar rather larger ones on segments 7-11, one to each; these subdorsal tubercles existing also on the other segments but being there smaller than the dorsal ones; a lateral row of 6 similar ones on segments 6-11, of which only those on segments 7 and 8 are of the size of dorsal ones, the others being mere dots; anal segment has two small thick tubercles, one on each side of base of cremaster. Colour of pupa is dark brown-grey splotched with grey on wings and segments 4-5 principally. L: 20 mm.; B: 8 mm.; L of longest tubercle: 1 mm.

Habits.—The eggs are laid singly or in groups of six or seven on the undersides of very young leaves just above the ground; the larva is generally found, when full grown or moderately large, crawling about on the ground, but rests, if possible, half on the stem of its plant, half under a leaf. The butterfly is one of the commonest in the better wooded parts of India, the female especially being one of those most often met with in gardens, plantations and woods where there is a plentiful ground-flora of urticaceous plants which constitute the food of the larvæ. These butterflies may be seen at all times of the year, but more especially in the damp months, flying about near the ground upon which they constantly settle, often walking from one small plant to another; at times they fly into the verandahs of houses and settle on the ceilings and walls with their wings folded over their backs and remain stationary for hours together; in the jungles they are constantly found resting similarly on the undersides of branches, leaves, &c. The males are fond of the sun and sit upon leaves and sticks with the wings

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often outspread exposing the glorious irridescent purple and blue colours so characteristic of the insect; they are very pugnacious and attack any other butterfly flying past with great zest and pertinacity, chasing it for considerable distances, to return always to the same perch on leaf or stick. This is perhaps the reason why so many ragged specimens of the sex exist as compared to the females; and it is not an easy matter to catch a perfect male. The males are found even on the tops of the highest hills, where the females are rarely met with; they go up to enjoy the sunlight and free air; perhaps, also, they are fond of company and enjoy the pleasure of hunting the males of other species that come up to bask in numbers during the hottest hours of the day. The larvæ are active and eat voraciously. The pupa is formed on the underside of a leaf, sometimes from the perpendicular face of a rock or from a branch of a tree; and always hangs loosely, though it is quite strongly attached to a copious pad of silk. By colour, shape and general appearance it is "protected" and is not easily discovered. In the months when the food-plant is plentiful (generally from October to January) the development from egg to imago is very rapid, in the really dry weather the time is more prolonged. The food-plants of the larva are all urticaceous, that is belonging to the same family as the figs and jack-fruit; only they are herbaceous and not trees. Two of the plants it has been found on are *Fleurya interrupta*, Gaud, and *Elatostemma cuneatum*, Wight. It is said that the larva feeds also on the food-plant of the next species, *viz.*, *Portulaca oleracea*, Linn., but this requires confirmation. This species is distributed throughout Indian limits and extends to the Malayan subregion and China.

Dr F. Moore gives the genus *Hypolimnas*, Hübner, as a synonym of *Apatura*, Fabricius. The type of *Apatura* is *Apatura iris*, the purple Emperor of Europe and the larvæ of it and *Hypolimnas bolina* and *misippus* have nothing to do with each other, being very dissimilar. As remarked before, the larvæ of *Apatura camiba*, *Euripus consimilis* and *Apatura iris* are very similar, those of *Charaxes* and *Eulepis* are rather like them; they are all naked except the heads which are armed; those of *Hypolimnas* have armed bodies like in the vanessine group.

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61. Hypolimnas misippus, *Linn.* (Pl. B., figs. 8 ♂, 8*a* ♀).—Male *upperside* rich velvety dark brownish black. Forewing: a broad, oval, oblique white spot from below vein 3 to vein 7 and a preapical smaller similar white spot; both spots crossed by black veins and surrounded by irridescent blue. Hindwing with a much larger, similarly rounded, white spot surrounded by irridescent blue, but the veins crossing it yellowish, not so prominent as on the forewing; two or three minute specks of white at the tornus. Cilia of both fore and hindwings white alternated with black. *Underside* forewing: bases of interspaces 1 and 2 and cell rich light castaneous, discal area fuscous brown; apical half golden brown; basal half of costal margin flecked with white; cell anteriorly black with three white spots; a narrow, transverse, very short, white mark beyond apex of cell; a very broad somewhat oval discal white patch from costa to middle of interspace 2 edged with diffuse dusky black; the preapical white spot as on the upperside but not surrounded with blue, continued posteriorly as a transverse series of small postdiscal white spots; an outer transverse series of white lunules divided by a sinuous black line followed by a terminal black line. Hindwing: basal and postdiscal areas chestnut-red; a black spot at base of vein 8 defined by white lines; a very broad medio-discal white band from costa to dorsum, crossed at apex of interspace 1*a* by a transverse black mark, beyond the middle of interspace 7 by a broad black bar and, in interspace 7, bordered inwardly by black; a postdiscal series of small white spots in continuation of those on the forewing; an inner subterminal series of paired, subtriangular, small white spots, an outer subterminal line of slender white lunules, an intervening black sinuous line between the two series and a black terminal line. Cilia of both wings white alternated with black. Antennæ, head, thorax and abdomen dark brown; beneath, the palpi and thorax white, the abdomen black banded white. Female is polymorphic, that is, has several different forms.

First form.—Upperside: rich tawny. Forewing: the costa, the apical half of the wing and the termen black, the inner margin of this black area follows a line crossing the cell obliquely and curving round to near the apex of interspace 1*a*; a white spot beyond apex of cell; an oblique band of elongate white spots, a more transverse, short, subapical series of three or four much smaller white spots, and an inner and an outer subterminal transverse series of very small, slender, white lunules. Hindwing: a transverse round spot in centre of interspace 7, a dusky spot showing through from underside at end of cell, the terminal margin broadly black, the latter traversed by two transverse series of paired, white, small lunules. Cilia of both wings alternated white and black. *Underside*: paler tawny yellow, the disc of the forewing deeper tawny; the markings are much as on the upperside but differ as follows:—Forewing: three white spots along the anterior margin of cell, the black on the apical area beyond

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the oblique band of white spots replaced by golden. Hindwing: a black spot at base of vein 8, another at base of interspace 5, and a postdiscal transverse series of small white spots in addition to the markings as on the upperside.

Second form.—Similar to the above but the disc of the hindwing on both upper and under sides white.—*alcippoides*, Butler.

Third form.—Similar to the first form, but on the forewing, the oblique series of elongate spots yellowish and the middle portion of the black apical area tawny. Exp. 70-90 mm.

Larva.—The caterpillar is extremely like that of the preceding species; body thickest in the middle, tapering to head in the front three segments and very little to anal end in segments 13 and 14; these last two segments have the dorsal line a quarter-circle curve, the anal flap itself being in a plane at an angle of 90° to the longitudinal axis of the larva: this flap is rather large, triangular in shape, with the apical portion somewhat swollen in the centre; the legs are not large, the prolegs are cylindrical and stout. The head is nearly square, somewhat convex laterally, conspicuously bilobed with a cylindrical, not very stout, tuberculate horn or process on the vertex of each lobe, these horns being very slightly curved and directed somewhat forwards out of the plane of the face; the face is nearly flat; the clypeus fairly large and triangular; the surface distantly lowly-tuberculate, each tubercle bearing a short hair; some longer hairs at base and sides of face; the colour of head is orange with a broad black line on each side of clypeus, not reaching its vertex nor its base and a shorter and narrower one above, nearer the vertex of head; the horns and eyes are black, the jaws and ligula dark coloured, the labrum and second antennal joint dirty watery white. The surface of the body is dull and somewhat velvety with the usual spinous processes: one subdorsal, one dorsolateral, one supra and one subspiracular and two or three more small ones below that again—as in *Hypolimnas bolina*; all processes are dirty glassy white as well as the spines at their bases; the spines further up are black; the surface is covered also distantly with minute white tubercles arranged more or less in transverse rows across the segments. Spiracles deep black with narrow, raised, shiny, black borders and are oval, flush, rather large. The colour of body is chiefly black, velvety in a dorsal, rather narrow band and in the lateral centre of each segment, smoky with a greenish tinge elsewhere; many minute, orange circles surrounding the minute tubercles; the spiracles also surrounded with orange and the subspiracular region blotched orange; belly smoky black; pseudo-legs and true legs shiny orange. L: 48 mm; B: 7 mm; L. of body spinous processes: 2·5 mm; of horns: 3 mm.

Pupa.—The chrysalis of this species is very similar indeed to that of the last; there is so little difference in shape, colour or anything else that it

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needs no separate description. In size the variation is less, as might be expected from the small difference in the measurements of the imagines of the present species as compared to those of the preceding.

Habits.—The ways of the larva are much the same as for the last species except that, the food being somewhat more limited, it is not so commonly met with; it is not so plentiful in the regions of heavy rainfall and forest as *H. bolina*. The butterfly has also much the same habits as that species though the female is very much more rarely seen than the male, which is not the case with *H. bolina*. The male sits on the undersides of leaves within two to six feet of the ground when resting during the day-time and at night when the wings are closed over its back, the forewings sunk between the hindwings; it is not quite so pugnacious as the preceding species and is only very occasionally seen in houses—probably because the individuals are not numerous enough. The insects are not often seen at flowers. The flight is strong, though never long sustained, of the ordinary "skipping" type, though less pronouncedly so than, for example, that of *Charaxes*; the pace is sometimes very fast, at other times fairly slow and it never carries the insect to any great height above the ground. The males are fond of basking on low bushes and even on the ground in the sun. The food-plant is *Portulaca oleracea*, Linn., (*Portulacaceæ*), a spreading weed with succulent branches, thick fleshy leaves, and yellow flowers, lying more or less flat on the ground, belonging to the botanical family containing the spinach and is itself often used as a vegetable in India. The plant is commoner in the open, drier parts of the country than in the forest-clad hills where there is plenty of rain. Like the plant, the insect is naturally more plentiful in regions of moderate rainfall than where the monsoon is heavy. It is, however, found throughout Indian limits, Ceylon, Burma and extends to the Malayan subregion and China.

62. Kallima horsfieldi, *Kollar.* (Pl. D, fig. 21).—*Dry-season form.*—Male and female *upperside* indigo-blue; in some specimens with a decided green tint. Forewing with a broad, oblique, slightly curved, sinuous-edged, pale blue band turning to white on the anterior half; the distance measured on the costa of the outer edge of this band from the base of the wing greater than half the length of wing; its inner margin bordered by short, obliquely placed, detached, linear, black markings; apical area beyond the band jet-black with a preapical white spot; medial hyaline spots, the lower variable

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in size, in interspaces 2 and 3. Hindwing uniform, the costa and apex broadly and the abdominal fold, brown; vein 1 with long, soft, greyish-brown hairs along its length, extending also over the abdominal fold. Fore and hindwings with a dark-brown, subterminal, zigzag line commencing below vein 3 on the forewing. *Underside* resembling a dry leaf; ground-colour variable but usually some shade of brown (rusty, greyish and ochreous brown being the most common), always with scattered dark dots or little patches having the appearance of fungous-like or lichenous growths so common on dead leaves in the tropics. When the insect closes its wings over its back the likeness to a dead leaf is most striking and is heightened by a straight, narrow, transverse, dark band running from the apex of the forewing to the tornus of the hindwing, often with oblique narrower, similar bands or lines given off from it, all simulating the mid-rib and lateral veins of a leaf; the hindwing in all specimens has a more or less obsolescent or faint series of postdiscal ocelli, traces of which are also apparent on the forewing. Antennæ dark-brown; head, thorax and abdomen very dark greenish-brown; beneath, the palpi, thorax and abdomen ochraceous earthy-brown.

Wet-season form.—Male and female similar. Differs in colour of the discal band on the upperside of the forewing; this is of a uniform pale blue of a slightly lighter or darker shade, varying individually, but not turning to white towards the costal margin as in the dry-season specimens. *Underside:* ground-colour on the whole darker than in the dry-season form but with the same protective colouring.

The apex of the forewing and the tornal angle of hindwing are more produced in the female than in the male and much more produced in the dry-season form than in the wet-season form; the hyaline spots on the disc of the forewing may be large, small or entirely wanting in both sexes of both forms.

Egg.—Is lengthened dome-shaped, the top hemispherical, the transverse section of the rest circular, smallest at the base, the breadth slightly greatest at origin of hemisphere; twelve thin, distinct, raised meridional ridges from base, losing themselves towards apex of egg; surface smooth; colour exceptionally dark-green. B: 0·9 mm.; H: 1·2 mm.

Larva.—The larva is of the type of *Hypolimnas*. Head shiny black surmounted by two divergent horns pointing up and out at an angle of 135° with the plane of the face; their surface rugose with small hair-bearing, mostly thinly conical, but some cylindrical and longer tubercles, all black and shiny; surface of head with some long, cylindrical tubercles on cheeks and a few hairs elsewhere; clypeus rather large, triangular; the whole head shiny black, labrum only whitish. Spiracles small, oval, black. Body surface covered with fine hairs; the spines are all longly conical, rather finer than those of *Hypolimnas*, all flesh-red, ending in a fine black bristle,

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rising from a swollen short-conical black base. Segment 2 has, on each side of dorsal line, four black, hair-bearing, cylindrical tubercles in a line one below the other, two blunt red spines one below the other in front of spiracle and two more below them in a line on base of leg; 3rd segment: one subdorsal bristle-bearing tubercle, one supraspiracular and three subspiracular in a triangle; segment 4 is like segment 3; segment 5 has one subdorsal, one dorsolateral, one supraspiracular, one subspiracular, all alike and two where the base of leg would be, one below the other; segment 6 has the same, but three on base of leg in a triangle; segment 7 the same, only two in a line under the subspiracular one; segments 8-10 like segment 7; segment 11 like segment 5; segment 12 has two dorsal, one near front margin, one near hinder margin, one dorsolateral, one antespiracular, one subspiracular and no more; segments 13 and 14 have one only supraspiracular; the latter segment is semicircular in outline, the end dull black in a dorsal triangular space. Colour is a fine rich reddish brown with a greenish tinge; prolegs with their outer faces shiny black; true legs shiny black. All spines the same length with a few fine black bristles set at an angle of 45°. L: 43 mm.; B: 7 mm.; L of horn: 4 mm.; of spines: 2·5 mm.

Pupa.—The pupa is of the type of that of *Hypolimnas bolina.* The head is produced into two short, conical, stout points, separated narrowly by a curved sinus; the points are directed straight forwards, one in front of each eye. Thorax strongly and highly carinated in the dorsal line with a strong tooth at shoulder and another immediately behind it on the line of wing, *i.e.*, the shoulder is double-toothed. Abdomen as stout in the centre of pupa (segments 7 and 8) as pupa at shoulders and as high as at apex of thorax, curved rather much at extremity so that the cremaster is nearly at right angles to the longitudinal axis of the pupa; this cremaster exceptionally large, slightly hollowed out above and below, consisting of a square basal piece followed by a smaller square piece, the attachment surface being at the extreme edge-centre. Spiracles of ordinary size, yellowish in colour with black central slit, longly oval in shape. Surface of pupa somewhat rugose; on abdomen are rows of conical bosses or tubercles: one dorsal, one subdorsal, lateral and spiracular; the dorsal tubercles large on segments 8 and 9; the subdorsal ones of segments 7-11 still larger and recurved, those on segments 8 and 9 being largest of all; the tubercles on other segments and in other rows are mere little knobs. Wings expanded as in *H. bolina* and the line of expansion is slightly curved. The colour is black-brown and yellow-pink; thorax, segment 8 and the regions of segments 11 and 12 being lightest in colour. L: 25 mm.; B: 9 mm.

Habits.—The egg is laid, generally single, on the underside of a leaf low down near the ground; the young larva emerges about three days after the egg is laid. It is a shiny light brownish-green at first with a shiny black head with a stiff, simple, curved

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shiny black bristle on the vertex of each lobe; all the body-spines or processes are also simple, shiny black, curved bristles. It is 5 mm. in length by 1·5 mm. in breadth at the end of the stage. An egg laid on the 11th of August produced a larva on the 15th. This entered on the 2nd stage on the 19th and was then already like it was to be in the later stages, that is, the head was shiny black with a tubercled horn on vertex of each lobe and the body processes were tubercled and black, each ending in a black hair; the dorsal spines or processes of segments 5 to 12, which are not represented at all in the first stage, were now fully developed; the colour of the body was light greenish yellow-brown and shiny all over; the size at the end was 8 mm. by 1·5 mm.; that was on the 25th. It was in the 3rd stage on the 29th—had entered on it some time before—and the head was black covered with some longish spine-like black hairs and some light ones about jaws; basal antennal joint and labrum watery whitish. Colour of body red-chocolate, slightly ochreous at anal end with subdorsal spines or processes of segments 2-12 bright ochreous and the supraspiracular ones slightly ochreous on segment 3-9; all the rest shiny black. Spiracles oval, flush, black in colour. Surface of body shiny, rather greasy looking. L: 17 mm.; B: 3 mm. without processes. The larva generally sat on the underside of a leaf; latterly, as often as not, on the stem of the plant, generally slightly contracted and straight. It is sluggish in its movements and feeds generally in the mornings and evenings. It is fond of the shade and does not like the sun. The pupation takes place on the underside of a leaf or from a twig or against the stem of the plant and generally low down near the ground. The pupa is firmly attached though it hangs loosely. The butterfly is not likely to be found away from the hills and forest, neither will it be met with where the rainfall is scanty; indeed it is an insect of the dampest parts of India. The flight is very like that of *Hypolimnas bolina*: fast, somewhat devious and of short duration, of the usual up-and-down type where the wings are brought together over the back between the strokes; though it is sometimes varied by a short "sail" with the wings kept outstretched. *Kallima* keeps to the thick jungles, rarely visits hill-tops or open spaces, but is fond of clear nalla-beds in evergreen

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forests where it may be met with sitting on a leaf or underside of a branch, or on a tree-stem ; occasionally taking a short flight after an intruding individual of its own species, that has a beat further along, to return to its post. It generally rests low down near the ground and very rarely rises far into the air ; when disturbed suddenly from the underside of a leaf or from a plant-stem it will fly up some short distance and then drop down into a thicket where it speedily disappears from sight among the leaves and twigs. Its habit of sitting with its wings closed over its back when at rest, added to the colouring and pattern of the underside and their shape make this an easy matter. The resemblance of the insect when at rest on a stem or twig to a dead leaf, always with head pointing downwards as is its habit, has been alluded to more than once already in these papers. It is, as has also been before stated, one of the Leaf-Butterflies of India and the name is known to nearly everybody, if not the insects themselves. The species mentioned here is depicted on coloured plate D, figure 21. The picture is very fairly good, though the colour is somewhat too reddish and the left-hand wing is not green enough. Place your hand over the left wing and the resemblance of the sitting insect to a dead leaf will be at once apparent ; though the particular type of underside chosen for representation is one of the least " dead " of the many types. It is taken from a wet-season male and these are always the most boldly marked and therefore the least " deceptive." *Kallima horsfieldi* hardly ever rests on the ground, except when drinking toddy under a palm that is being tapped, and is never seen at flowers ; it is fond of oozing tree juices and the gums exuding from ripe fruits. A whisky and soda in the jungles will often attract more than one. A sponge saturated with toddy is a very good bait, but it must be placed in spots frequented by them. They are difficult to catch with a net because of the sort of places they live in ; it is generally impossible to get a sweep with a decent-sized net, and they are extremely difficult to capture in a small one because of their quickness and " deviousness " of flight. So the best dodge to secure specimens is a toddy-sponge on the edge of a cleared space in an evergreen or nalla-bed and a smallish net. It is quite a pleasant occupation on a hot day.

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Kallima inachus, Boisduval, is the Leaf-Butterfly with the broad orange band across the disc of the forewing one sees so often in collections; it comes from the lower elevations in the Himalayas from Kashmir to Sikkim and is found in Orissa, the Eastern Ghats, Pachmarhi, Assam, Burma and Tenasserim. *Kallima horsfieldi* is found in Western and Southern India from Bombay southwards, Ceylon, Burma and Tenasserim. There are two other species within British-Indian limits, more in the Indo-Malayan Region.

The foodplants of the larva of *Kallima horsfieldi* are of the botanical family *Acanthaceæ*; it has been found on several species of the genus *Strobilanthes*, the commonest being *S. callosus*, Nees, which covers the jungles on the Western Ghats as an undershrub in many places for miles and miles. It is a plant growing to 20′ in height with a stem that may reach 2″ in diameter but is generally less, rough, longly elliptical leaves which are pointed at one end and pink or bluish flowers with extremely sticky bracts that appear every seven years, after which the whole plant dies down. The flowers smell rather strongly but the scent is not disagreeable, and all the jungle animals are perfumed with it at such times from passing through the thickets. The plant being so plentiful, it is not to be wondered at that the larvæ are not easy to find; indeed, although the butterfly is very fairly common, it is rare to meet with more than one or two caterpillars during a whole year's wandering in the jungles where it exists.

The specimen figured in the Plate is a male of the wet-season form. The figure is fairly good though not bright enough; there is, as usual in these three-colour reproductions, too much red in it.

63. Cethosia cyane, *Drury.*—Male *upperside* tawny, in fresh specimens a rich reddish tawny. Forewing: anterior and apical two-thirds black, the margin of this colour waved and irregular, following a line dividing the cell longitudinally and circling round to near the posterior angle; a short, broad, oblique, white bar beyond apex of cell, the veins crossing it and a spot in interspaces 3 and 4 black; a transverse, indistinct row of small spots and a terminal series of ⸮-shaped lunules white. Hindwing: three or four spots just beyond apex of cell, a subterminal row of spots and the termen broadly black, the last with a series of white lunules as on the forewing. *Underside* variegated with red, white, pale blue, ochraceous and black; the terminal margins of both wings broadly black with white

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lunules as on the upperside; in the middle of each lunule a short white streak from the margin; cilia alternately black and white. Forewing: the cell with transverse bands of red, blue and black; the base and disc below the cell red, spotted with black followed by pale blue, ochraceous and black; the white oblique band as on the upperside, beyond it a transverse incomplete row of lanceolate, white marks, with three black spots in each, followed by a terminal, ochraceous band paling inwardly. Hindwing: the base and cell pale blue and red, crossed by several broken, incomplete, black lines, then alternate bands of white and ochraceous, two of each; the outer white band narrow and marked in each interspace with three black spots arranged as a triangle. Antennæ, head, thorax dusky brown; abdomen above tawny, beneath white.

Female similar to the male in markings but the tawny ground-colour replaced by pale greenish-white, somewhat brownish on the upperside of forewing, the extent of black on this wing larger. *Underside* with all the markings paler than in the male, the red at the base of the wing replaced by brownish yellow on the fore, white on the hindwing. Antennæ, head and thorax dusky brown; abdomen dusky above, white beneath. Exp. 90-100 mm.

Moore gives the larva as "Cylindrical, purplish-black, segments with alternate yellow and crimson bands; head armed with two long spines, segments with dorsal and lateral rows of fine spines. Feeds on *Passiflora*, July."

The insect is found in the Himalayas, Mussooree to Sikhim, rare towards the west, Bengal, Orissa, Assam, Cachar, Arrakan, throughout Burma and Tenasserim.

64. Cethosia mahratta, *Moore.* (Pl. D, fig. 20).—Male *upperside* tawny yellow; often with a rosy tinge on the basal half of forewing. Forewing: cell anteriorly along its length and the outer half of the wing, following an irregular line from apex of cell to tornus, black, the black in cell formed of coalescent transverse bars; a broad, discal, oblique white fascia traversed by the black veins, followed by a postdiscal series of black-centred, outward-turned, slender, white lunules, a transverse series of white spots and another subterminal series of similar white lunules; interspaces 1 and 2 with three or four black spots. Hindwing with broad black costal and terminal margins; interspaces 1 and 1*a* with the markings of the underside showing through; cell with some dull black transverse bars; interspaces 1-5 with broad, median, short streaks from bases followed by a large spot margined with white, all black; followed by a postdiscal series of black lunules with their points turned inwards, then a subterminal tawny-yellow band and a row of slender white, outward-turned lunules beyond. *Underside* variegated with ochraceous red, bluish white, yellow and black; the terminal margins of both fore and hindwing broadly black with white unules, as on the upperside and median white short lines from the margin

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in each lunule; cilia alternately black and white. Forewing: basal area ochraceous red, cell with transverse short bands of black and bluish white; below the cell: the ochraceous red at base, followed by whitish and then yellow, the disc spotted with black; the oblique white band as on the upperside, succeeded by a transverse postdiscal series of large black spots ringed narrowly with white with a row of paired black dots beyond and a subterminal, broad, yellow band, its inner margin sinuous. Hindwing: the basal area bluish crossed by broken transverse, broad, black lines and followed by a red, a bluish white, a yellow, a purer white and lastly a subterminal yellow band with rows of black spots between; on the white band a median series of large black spots. Antennæ black, head and thorax brownish-black, abdomen ochraceous; the thorax beneath ochraceous banded with black. Female similar, but the tawny yellow on the upperside paler, the markings larger and somewhat diffuse. Exp. 72-100 mm.

Egg.—The egg is cylindrical, round-topped, with a central, flat-bottomed cell surrounded by 7-9 little fossets from each one of which 2 moderately coarse "meridians" or ribs run to the base; each two ribs are connected by 7-10 parallel, transverse, finer ribs at right angles to them from top to base of the egg. The colour is shiny yellow; the height considerably more than the diameter.

Larva (Pl. I, fig. 9).—The larva is cylindrical, the head is horned, the body spined; the colour black, banded broadly red and yellow. The head is square seen from in front, depressed in the centre of vertex with a depressed line down centre of face; the vertex of each lobe surmounted by a long, fine, cylindrical, very finely spined horn, the two diverging and half as long again as the head is high; the colour of head is black, shiny all over, the surface covered sparsely with fine, erect, black hairs. Segment 2 smaller than head. Body quite cylindrical, the anal segment with dorsal slope, nearly perpendicular to longitudinal axis of body. Spiracles oval, with raised edges, conspicuous and black. Surface of body velvety, the connecting membrane between segments shiny; each segment with a subdorsal, long, pointed, very finely-tubercled spine; those of the 14th segment reduced to mere tubercles; an intersegmental similar, lateral spine between segments 2 and 4 and between segments 3 and 4; segments 5-13 with a similar central lateral spine, though somewhat shorter; segments 5-13 with a subspiracular similar, still shorter spine; the subdorsal spines are nearly as long as the head-horns, except those of segment 2 which are slightly shorter. The colour of body is very dark black-red with broad, central bands across the body, transverse to the length, bright red on segments 3-5, 7, 9-13, yellow on segments 6 and 8; the horns are shiny black as well as the spines. L: 42 mm.; B: 6 mm.

Pupa (Pl. I, fig. 9*a*).—The pupa is of the shape of *Hypolimnas* or *Kallima*, but is abnormal in having some of the abdominal tubercles developed into flattened expansions; the colour is also somewhat similar though more

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variegated. Head quardrate, square in front with a flattened, spirally twisted process proceeding from the front of each eye, diverging one from the other at first, then converging towards the tips; they are not very long and are widely separated at their bases, they are toothed on the outer edge and have some small tubercles on the somewhat thickened extremities. Segment 2 is oval in shape (the dorsal visible portion, that is,) is convex transversely and is nearly 2/3 as broad as long. The sides of head and segment 2 are parallel, the shoulders have each a small, flattened, short, double-toothed process. The wings are suddenly expanded behind the shoulders into a short flat process which as suddenly ceases about segment 4: this expansion is also double-toothed at extremity. The thorax "hump" is hemisphere-shaped and is highly carinated in dorsal line from the front margin to apex. The constriction behind the thorax is wide and slight dorsally and laterally. Abdomen is circular in transverse section, decreasing in diameter from the stoutish segment 7 to the thick, broad, hexagonal, not very long cremaster which is hollowed out above and below. The wings are slightly curved in their ventral line of junction with each other; the ventral line of abdomen is nearly straight. The whole aspect of the pupa is slight for its length. On segments 2-12 is a subdorsal, longish, pointed tubercle, those on segments 6-9 and segments 11 and 12 have a thin, flat wing to each side of them, the plane of this wing being parallel to the dorso-ventral plane of pupa, the wings of the tubercles of segment 7 being exceptionaly large, those of segment 8 half the size, those of the other small. Segments 6-11 have a lateral pointed tubercle, segments 8-11 a subspiracular one also. There are paired ventral tubercles on the ventrum as also one at base of proboscis. Spiracles longly oval, dark in colour, of ordinary size. Surface of body finely rugose, transversely aciculate. Colour of pupa is brown marbled with white and grey and black, with a subdorsal gold patch on segments 2, 4, 5. L: 29 mm.; B at broadest part which is at the expansion of wings: 9·5 mm.; H at segment 7: 9·5 mm.; L of head process: 2 mm.

The figure is that of the male and is good although, as usual, not bright enough.

Habits.—The eggs are laid in groups of 15 to 20 and more on the undersides of leaves, generally of fairly fresh leaves. The little larvæ emerging, live gregariously there and continue the same mode of life up to the end, feeding in rows along the edge of a leaf. These larvæ are very active, eat voraciously and, consequently, grow fast; they are not very subject to insect parasitism; perhaps the vivid colouring makes them look rather dangerous. The pupation takes place, in rows very often, along and from a twig or stem, not necessarily of the food-plant. The pupa hangs loosely but

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is very firmly fixed to a pad of black silk. It wriggles when touched. The larvæ drop to the ground when alarmed, especially when they are young. The imago or butterfly is, like the larva, protected from enemies by its taste; it is, consequently, somewhat difficult to kill by the ordinary thorax-pressure. Its flight is, as a very general rule, slow and, what is called, weak, somewhat like that of a danaine butterfly; it keeps near the ground amongst low jungle, always goes straight ahead, though by no means in a straight line and does not affect "beats" like *Danais* and *Euplœa* often do. It does not bask, and stays a long time on the wing, resting near the ground in wet weather and at nights with wings closed over the back. It visits flowers. Its distribution is throughout Southern India in jungly places. The larva feeds upon *Modecca palmata*, Lamk., the wild Passion-flower of the family *Passifloreæ*, with grey-green, somewhat fleshy, lobed leaves and long, trailing tendrils, a globular, orange coloured fruit, about one inch in diameter, and a woody rootstock. The leaves and young parts are cooked and eaten as a vegetable by the coast people in Kanara. The caterpillar will eat the leaves of the cultivated passion-flower also.

There are six species of *Cethosia* found in Indian limits; others frequent the Indo and Austro-Malayan Regions.

65. Atella phalantha, *Drury* (Pl. C, fig. 10).—Male and female *upperside* bright ochraceous yellow, spotted and marked with black. Forewing: cell crossed by three short, sinuous lines and one along the discocellulars, a series of spots beyond, bent inwards below interspace 4 and continued immediately below the median vein, followed by two transverse series of discal spots, a postdiscal series of continuous lunules, a subterminal slender line, and a terminal series of spots at the apices of the veins. Hindwing: basal half with three or four transverse rows of obscure spots, better defined anteriorly, a discal series of four spots, a postdiscal series of slender lunules, a subterminal sinuous line, and a row of terminal spots as on the forewing. *Underside* paler ochraceous, the markings much as on the upperside but fainter and paling to reddish-brown; the terminal spots of the two discal rows on the forewing large, conspicuous and black. Forewing stained with pale purple between the transverse lines across the cell and beyond its apex, also broadly along the terminal margin in the middle of the wing. Hindwing: the outer half more or less suffused with pale purple. Antennæ, head, thorax and abdomen dark ochraceous; thorax and abdomen beneath whitish. Exp. 50-63 mm.

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Larva.—The larva is spined like that of the last species but has the head without horns and quite smooth; the colour is oily brownish-purple with black spines. Head dark brown-yellow, with a still darker brown clypeus, centred at base by a white triangle; a large oblique black spot at base of each lobe over eyes reaching half way up face in some specimens; the shape is that of a heart, the broadest side being the vertex. The body is cylindrical, slightly constricted at segment margins; anal end perpendicular to longitudinal axis of larva, rather high; the head is somewhat broader than segment 2, nearly as broad as the body is in middle at segment 7, which is the broadest part of the larva. Spiracles black, bordered narrowly with white, oval. Surface oily-shiny, with the following spines, themselves set with fine setæ: segment 2 with one subdorsal, a lateral one on segment margin 2/3; segment 3 with one subdorsal and one on segment margin 3/4; segment 4 one subdorsal; segments 5 to 12 have each a subdorsal, lateral (might be called supraspiracular) and subspriracular; the 13th has a subdorsal spine and segment 14 a lateral one on margin towards middle of segment. All the spines are of nearly equal length, not as long as the body is broad in the middle. The colour of the body is purple-brown, oily looking, with a subspiracular waved white line; belly reddish-brown, spines and their setæ shiny black rising from black tubercles, except the subspiracular ones which are whitish and rise from yellow-brown tubercles. L: 30 mm. B: 5 mm.

Pupa.—The pupa is of more or less ordinary shape, bright green, marked with black, rose-crimson and mother-of-pearl. The head is square with two minutely black-tipped, conical tubercles, one on each eye, directed straight forwards; the eyes bordered with red in front. Segment 2 is flattish on top; thorax is rather square seen from above, convex; shoulders angled; constriction at segment 5 dorsally little, laterally wide and shallow. Wings expanded latterally slightly from just behind shoulders to segment 6. Abdomen stout, curving at end, so that the last segments have their axis nearly at right angles to the longitudinal axis of the pupa. Cremaster compressed laterally, the extremity being longer than broad, and set with suspensory hooklets, so that the pupa hangs horizontal to the surface to which it is fixed. Spiracles of ordinary size, oval, slightly raised. Surface shiny, smooth except for a pair of small, conical, sharp tubercles to each segment, subdorsal, one on each side; they are hardly visible on segments 4, 13, 14; small on segments 6, 8, 10, 12; larger on segments 7, 9, 11; those on segment 2 are also small; on thorax there is an additional lateral one. The colour is a bright, clear, grass-green; all the tubercles are mother-of-pearl, tipped with black and rose-crimson; the wings have one long mark along the inner margin, mother-of-pearl bordered with rose-crimson, reaching from shoulder to near the tornal angle, and another, similar, reaching from just behind shoulder to half way towards

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costal margin on the disc. When the pupa is formed away from a surrounding of green leaves, say in a breeding-cage, then the colour may be grey with black patches and marks but no red or mother-of-pearl. L: 17 mm.; B: 6 mm.

Habits.—The egg is laid upon young shoots; the trees are generally all and wholly a mass of young shoots during the great laying time in March-April. The larva lives on the underside of a leaf, is extremely active, running about at a great pace and falls by a silk when touched or alarmed at very slight provocation. It turns green before pupating but is otherwise always of the colour given in the description above. It is very common in most parts of India all through the year except in the seasons of heavy rain. In Kanara, for example, it is hardly to be found at all in the months of June to October and there is little doubt that this off-time is passed in the egg state. The growth of the caterpillar is extremely rapid, the time from the laying of the egg to the newly-born butterfly occupying but the short space of twenty-one days! Truly a most marvellous performance when the number of changes the insect goes through is considered; the egg-stage, five moults during the larval life, then the pupal state. The butterflies emerging in the cold weather are lighter in colour above and have much more purple suffusion beneath than the ones that see the light in April and May when the shoots are possibly more succulent than the earlier ones; indeed the latter insects may have hardly any purple at all and have, in that case, the black spots much more clearly defined on the underside. The flight is powerful and quick, like most of the *Argynnis* tribe, for to that type the present insect belongs. It is not long sustained, however. The insect is fond of flowers and basks in the sun on leaves of trees and bushes, generally not far from the ground, sometimes, though sufficiently seldom, on the earth itself; it is an insect of open, sunny places and shuns the shade, being more numerously represented, therefore, on the borders of the heavier jungle tracts and out in the open plain country than in the jungles and hills of India. It rests with its wings closed very generally and always on the top of leaves; but often, when sporting in the sun-light, it settles with the wings half open, working them towards and away from each other while sitting. The flight consists of an exceptionally quick motion of the wings

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towards and away from each other with very little "skip" up and down, though there may be much deviation to either side from the straight course. The butterflies are rather pugnacious amongst themselves, pursuing each other on the wing with great vigour and determination. The food-plants are, as far as is known, all belonging to the same genus, *Flacourtia* (*Bixineæ*); the two species the caterpillar has been found on are *F. ramontchi*, L'Herit. and *F. montana*, Grah., both common in the Western Ghats, the former spread throughout Continental India. The insect is found also nearly throughout Continental India, in Ceylon, Assam, Burma and Tenasserim, extending to China, Japan and the Malayan Sub-region. The Assamese species of the food-plant, *Flacourtia cataphracta*, Roxb., extends to China and the Malay Islands and probably Japan.

There is another species of *Atella*, occurring very locally in the District of North Kanara, which has been obtained lately in Travancore and is known from Ceylon; it exists also in Sikhim, Assam, Cachar, Arrakan, Burma, and extends into the Malayan Sub-region. No specimen has ever been got from any part of India between Assam and Kanara, nor from anywhere on the East Coast. The larva is very like that of *A. phalantha*; so is the pupa. The food-plant is *Alsodeia zeylanica*, Thwaites, belonging to the *Violaceæ*, a family of plants nearly allied to *Bixineæ* and containing most of the food-plants of the *Fritillaries* (genus *Argynnis*) at home in Europe, which are not far removed from our genus *Atella*. *Alsodeia zeylanica* is known to exist in Malabar and Cochin and Ceylon but was unknown in Kanara until the caterpillars of the butterfly were discovered; and the plant is as locally distributed there as the insect. The name of this interesting species is *Atella alcippe*, Cramer.

66. Cupha erymanthis, *Drury.* (*placida*, Moore), (fig. 10)—Male and female *upperside* ochraceous light brown. Forewing: some loop-like, slender, dark, cellular markings; a broad, somewhat curved, yellow discal band from the costa to vein 1, not reaching the termen, broadening posteriorly, the margins irregularly sinuous, the inner defined broadly with black and produced outwards in interspaces 3 and 4, squarely indented in interspace 2 inwards and outwardly convex in interspace 1; a curved series of three black spots, the lowest the largest, in interspaces 1-3; apical area beyond

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the band black with a conspicuous yellow subapical spot in interspace 5 and a paler ill-defined, similar spot above it in interspace 6; posteriorly the black area is produced narrowly to the tornus and encircles a yellow spot near apex of interspace 2. Hindwing: a transverse, sinuous, very slender black line followed by a slender, somewhat lunular line, a transverse discal series of five black spots in interspaces 2 to 6, a postdiscal medially disjointed series of broad black lunules, a subterminal series of similar but straighter lunules, and a narrow terminal black band. The outer subbasal transverse line broadens at the costa and is outwardly margined by pale spots in the interspaces, these are anteriorly white, well defined, posteriorly obscure and often absent. *Underside* much paler, the discal band on the forewing also much paler; the black on the apical area replaced by pale brownish-ochreous; some obscure marking in cell of both fore and hindwings. Forewing: a discal, transverse, slender, chestnut-brown, lunular line, bent inwards above vein 5 and bordered outwardly by a series of dark spots; the large black spot in interspace 1 as on the upperside and the inner and outer transverse subterminal series of small, dentate spots. Hindwing: some indistinct cellular markings; the outer subbasal, dark, transverse line as on the upperside but more clearly defined, very sinuous; a transverse discal series of uneven lunules, paler than the ground-colour, followed by a series of dark spots, a postdiscal, very obscure, pale lunular band and a subterminal series of dentate, dark spots which are often obscure or obsolescent. Antennæ, head, thorax and abdomen ochraceous brown; beneath, the palpi, thorax and abdomen very pale ochraceous white. *Exp.* 58-74 mm.

The above description is that of typical *Cupha erymanthis*, Drury, of which *C. placida* is merely a race. There seem to be certain constant differences however; as for example, on the *upperside*, the discal band on the forewing in *C. placida* is distinctly darker yellow and its margins much less irregular, the black line defining the inner margin more slender; the spots on the band in interspaces 1, 2, 3 much smaller, especially the first, which is no smaller than the rest and diffuse; the subapical yellow spots are entirely wanting or very indistinct. On the hindwing the outer subbasal line with outer border of pale spots generally more clearly defined. Both wings shaded at base with olivaceous brown. *Underside* markings more heavily defined than in *C. erymanthis*.

C. erymanthis is "from along the foot of the Himalayas and up to 5,000 feet from Mussooree to Sikkim; hills of Assam; Burma; Tenasserim; the Nicobars; extending to China and the Malayan Sub-region; Andamans."

C. placida, Moore, exists in South India and Ceylon.

The transformations of typical *C. erymanthis* have not been observed as far as is known. Those of the race *placida* are as under:—

Larva.—Like that of *Atella phalantha* except that the spines are some-

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what longer and look finer from their colouration which is black and translucent whitish in bands; the head also differs. The shape of the head is heart-shaped, broadest across vertex, with a depressed line down the centre of face; is light yellow in colour with a large, shiny, black spot near vertex of each lobe and another lower down, smaller; the head is as broad as segment 2. The body is cylindrical, slightly constricted at segment-margins; anal segment perpendicular to longitudinal axis of body, rather high. Spiracles black oval, large, flush. The surface of the body is covered with minute white tubercles, of which there is a more or less distinct subdorsal row; head, base of legs as well as prolegs with moderately long, fine hairs; the body is besides armed with six longitudinal rows of cylindrical, finely setiferous, flat-topped spines, one subdorsal, lateral and subspiracular to each segment 5-12; segments 2-4 and 13 have each a subdorsal spine and there is a lateral one on the common segment-margins 2/3 and 3/4 and one, subspiracular (where the spiracle would be where there one), half the way between front margin and extremity of segment 14. Each spine proceeds from a black swelling or tubercle and is colourless with five or six black rings, the last two rings being at the extremity of the spine; from each ring proceeds a whorl of fine setæ; the basal setæ shortest; the top ones black; the basal ones white as a rule. The colour of larva is an oily looking rose brownish, the rose colour being more pronounced at the two extremities; anal segment with yellow flap; there are some black subdorsal spots between the spine on segment 13 and that on segment 14 on each side; there is a subspiracular, zigzag white line from segments 4-12; the belly is bluish-green and the legs yellow. L: 30 mm.; B: 5 mm. Spines all of equal length and very nearly as long as body is broad.

Pupa.—Similar to that of *Atella phalantha* except that some of the tubercles have long curved spines from their tips. Head square; rather flat dorsally; eyes each with a short conical, porrect tubercle; segment 2 with a slight ascent towards thorax in dorsal line; thorax square seen from above, convex; the wings slightly expanded from shoulders to about segment 5; the constriction dorsally little: laterally wide and shallow. The abdomen is circular in transverse section after segment 9, short, thick and curved down at the end so that the pupa hangs parallel to the surface it is attached to, the suspensory surface of the cremaster (the extremity) being longer than broad for that purpose; the cremaster is at right angles to longitudinal axis of the pupa. Spiracles are the same colour as the body, oval and of ordinary size. The surface of the body is shiny and is set with the following tubercles: a lateral one on segments 2, 7, 9, 11, and a laterodorsal one on segments 3-6, 8 and 10; the lateral ones (segments 2, 7, 9, 11) being prolonged each into a long, thin, curved, conical spine, the pair on segment 7 the longest (6 mm), those of segments 9 and 11 shortest (3 mm), being only half the length of the longest. The colour of the pupa is generally a bright, light or darker blue-green, the colour varying somewhat in different individuals.

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When green there are two black spots on segment 2, mother-of-pearl spot margined with rose-crimson posteriorly on each eye; all spines and tubercles surrounded at base with mother-of-pearl, inside which the cones are generally crimson; the spines are yellow tipped with black, the extreme point being white; the tubercles of segments 4, 5, 8, 10 may be green like the body; on segment 12 are two minute tubercles; anal segment has a circle of six black spots round base of cremaster; wings are slightly striated; a mother-of-pearl blotch at shoulder with two black spots; a long mother-of-pearl mark bordered by crimson along each inner wing margin from near the shoulder to segment 6; another similar one, oval in shape, starts a little posteriorly to this and runs along inside costal margin of wing but does not reach the ventral line of pupa; the pair of spines of segment 7 as also others may have the mother-of-pearl spots surrounding their bases coalescing over dorsum of pupa and there is black subdorsal spot in front of the coalescing marks on segment 7. L: 17 mm.; B: 6 mm. H: 6 mm.; L. of spine of segment 7: 6 mm.

Habits.—The egg is laid on young shoots. The larva is very active and lives on the underside of a leaf, falling to the ground by a silk when disturbed, or rather towards the ground, for it stays suspended in the air; it is of the same excessively quick growth as the larva of *Atella phalantha* taking only 21 days from the depositing of the egg to the appearance of the butterfly. The insect is much more a jungle species than *Atella phalantha* and is found mostly in regions of heavy rainfall, though it is occsionally met with on the borders of the Plains. In flight it is somewhat weaker than the species just mentioned, is fond of the shade rather than the sun, basks occasionally with the wings half opened and is not particularly pugnacious. It keeps near the ground as a rule but is found flying about the tops of the trees its larva feeds on in the jungles, that is at a height of some 50 feet and more, though trees of this size are not of common occurrence. The best place to look for the butterfly is always the food-plant of its larva. This is also true of the last species. The plants are the same for both: *Flacourtia montana* being that most affected by *Cupha* while *F. Ramontchi* is the favourite of *Atella*. *Cupha placida* is much more plentiful in the heavy monsoon regions in the months of September, February and March than at any other time, whereas *Atella* is hardly ever seen in September as already remarked.

67. Argynnis hyperbius, *Johanssen* (Pl. A, figs. 1 ♂, 1*a* ♀).—Male *upperside*: forewing rich orange-yellow, hindwing paler yellow with the following

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black markings: forewing: cell with a short, basal, transverse streak, a medial, broad, oval loop, its outer margin waved; a broad transverse streak beyond cell not reaching the median nervure; a broad streak along the discocellulars; a zigzag discal series of large spots angulated outwards in interspace 4, inwardly in interspace 2, a minute spot at base of interspace 1; a somewhat diffuse, large postdiscal spot in interspace 6; a postdiscal sinuous series of round spots, those in interspaces 1, 4 small; an inner subterminal, complete series of spots and an outer subterminal line, widening on the veins and a terminal line. Hindwing, a basal, transverse, obscure, narrow mark in cell, another above it in space 7, a transverse lunule across middle of cell; a small spot outwardly bordering the lower discocellular; a discal series of transverse spots in spaces 1-7, sinuous posteriorly; a postdiscal series of five spots in spaces 2-6; a subterminal series of somewhat lunular spots; finally a narrow band on termen traversed posteriorly by a series of blue, anteriorly by a series of ochraceous lunules. *Underside*: forewing pale terra-cotta red, shading into ochraceous towards the apex which is broadly suffused with that colour; markings as on the upperside with exceptions as: subcostal spot in space 6, upper two spots of postdical series, upper four of inner subterminal series and the anterior portions of the outer subterminal and terminal lines olivaceous brown; the upper two postdiscal spots centred white, with a white spot on each side; the upper four spots of the subterminal series touching, forming a short, curved band. Hindwing variegated with ochraceous, olivaceous brown and silvery-white markings, the last mostly narrowly margined outwardly by short, black lines; the veins clearly pale ochraceous; the medial silvery markings form a well marked, discal, sinuous series followed by a curved, postdiscal series of five olivaceous, round spots; each spot and the olivaceous, quadrate patch near base of cell each with a minute white centre; a slender, black, subterminal line widening at veins, followed by an ochraceous, narrow, lunular band and an outer, slender, black anticiliary line; the subterminal, black line margined inside by a series of slender, white lunules, bordered inwardly by a series of broad, olivaceous brown markings in the interspaces. Antennæ brown above, ochraeous red beneath; head, thorax and abdomen olivescent tawny; beneath, palpi, thorax and abdomen pale ochraceous. Female.—Similar, differing from the male in that, on the *upperside*, the apical half of the forewing from about the middle of the costa to just above the tornus is black, inwardly suffused with purple, crossed by a broad, white band from costa to the subterminal series of black spots; four preapical white spots, the upper three bordering, on each side and above, a very obscure ocellus, scarcely visible on the black back-ground; an inner and an outer subterminal, transverse series of slender white lunules. *Underside*: forewing: markings similar to those on the upperside, but the apex of the wing beyond the white band, ochraceous green. Hindwing as

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in the male, but the markings slightly broader. Antennæ, head, thorax and abdomen as in the male, the abdomen paler beneath. Exp. 80-98 mm.

Larva.—"Head and legs black; body black, the colour, however, obscured by orange-tawny markings. A broad orange-tawny dorsal stripe. Four straight, horizontal, simple, black spines on head; spines on pectoral segments black; on abdominal segments pink tipped with black, on caudal segments pink faintly black-tipped."

Pupa.—"Head and wing-cases pale Indian-red; ten pale metallic spots on back; abdomen dark pink; spines faintly black-tipped." This is amplified as follows: "The head ends in two well-separated blunt points; there are a pair of spines anteriorly, another in the middle, and a third smallest pair posteriorly on the thorax, the latter being hunched and keeled: on the abdominal segments there are eight pairs of spines, the third anterior pair longest."

Argynnis castetsi, *Oberthür.*—This is the Southern Indian form of the insect, differing from typical *hyperbius* which it otherwise closely resembles, differing, in the male, in the *upperside* being of a richer, brighter shade of orange-yellow; the black markings smaller, darker, subterminal transverse lunules of black terminal margin of hindwing of the same shade of orange-yellow as the ground-colour, no lunules being blue. *Underside*: the olivaceous brown on apex of forewing and variegating the hindwing of a greenish golden tint. There is a sex-mark of specialized raised scales along the middle of vein 1 on the upperside. It is probably a good species.

The females seem to be dimorphic locally. The *Nilgiri form* resembles the female of typical *hyperbius*; it differs on the *upperside* in the ground-colour being pale golden-yellow; in having the basal half of both wings shaded with metallic green, in some specimens olivaceous; the white oblique band of forewing smaller, the purple-blue shading along its inner margin less conspicuous, as is also the bluish tint on the white preapical spots and subterminal marking; the blue on subterminal lunules of hindwing also less marked. *Underside* the same as in *hyperbius* but the ground-colour on forewing paler terra-cotta red; the variegating olivaceous brown of hindwing distinctly greener.

As described from Trichinopoly the female is similar to the male, differing as follows:—*Upperside*: ground-colour pale golden-yellow; basal half of wings suffused dark olivaceous green; black markings larger; on forewing spots of subterminal series very large, coalescent or nearly so with one another, dentate spots on veins on inner terminal line; upper two postdiscal spots also very large, coalescent, the upper of the two joining on above and below to postdiscal spot in interspace 6, thus enclosing a prominent lunule of ground-colour. *Underside* paler.

The transformations of *Argynnis castetsi* have not been observed as far as is known but they are not likely to differ much from those of *A. hyperbius*

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though the description of caterpillar and chrysalis of this latter is meagre enough as given above.

Habits.—Nothing is to be found as to the habits of either species in any books and the writer has never come across the insect. It is not likely to differ much from the stronger-flying *Argynnis* at home. They are fast-flying, strong, active insects, fond of flowers and sunshine, keeping much to the neighbourhood of the ground though they occasionally fly high and far. The flight is that of *Atella phalantha*. The eggs are sure to be laid on or near a leaf of some species of *Viola* of which a few exist even in Southern India, though most are of temperate zones. The larva would probably eat the leaves of the garden violets or pansies readily. The genus *Argynnis* contains our home Fritillaries and is Nearactic as well as Palæarctic and Indo-Malayan in distribution. *A. hyperbius* is found from the Himalayas (Panjab to Sikkim) to Assam; Agra; Manbhum in Bengal; Khasi Hills; Upper Burma to China and Formosa; Sumatra and Java. A variety *A. taprobana*, Moore, slightly darker, is found in Ceylon. *A. castetsi* is confined to Southern India in the Nilgiris and Palni Hills. Some sixteen species are enumerated as occurring in India. The males of many of the *Argynnis* group of butterflies are much smaller than the females and this is the case very often with *A. hyperbius*.

68. Cirrhochroa mithila, *Moore.*—Male *upperside* is rich fulvous tawny, the basal area limited by the transverse, discal, black line, darker on both fore and hindwings than the discal and terminal portions of the wings. Forewing with a transverse, dusky, obscure, short, narrow band along discocellulars; a transverse dusky black, slightly sinuous, discal line terminating in an oblique, short, black streak in interspace 7; a transverse series of very obscure diffuse dark spots; apex broadly, termen narrowly black; from the former is emitted downwards a subterminal, rather heavily marked, zigzag, black line, complete from apex to vein 1, the black at apex somewhat diffuse. Hindwing with a transverse dark, discal, sinuous line and series of black spots in continuation of those on forewing, the spots much more clearly defined; a postdiscal, transverse series of slender, lunular, dark markings followed by an inner and an outer dark, subterminal line, the inner lunular, the outer straight. The discal transverse line and postdiscal series of lunules each bordered by a prominent, white, subcostal spot. *Underside* rather dark, uniform ochraceous, often suffused with purple to a more or less degree. Both wings with a common, pinkish white, conspicuous transverse, discal fascia, its inner margin highly sinuous, its

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outer straight, followed by a transverse series of spots as on the upperside; a common subterminal, transverse, lunular, narrow band and a straight, narrow border to the termen, the latter two of darker ochraceous than the ground colour. Basal area of both wings with some dark ochraceous, transverse, sinuous, short lines; the subterminal lunular line on hindwing bordered inwardly and outwardly by obscure, broad, pinkish white lunules; a distinct shade on middle of terminal half of both fore and hindwings, darker than rest of ground colour. Antennæ brown; head, thorax and abdomen fulvous brown; beneath, the palpi white, the thorax and abdomen ochraceous.

Female *upperside* has the ground colour a rich, bright yellow. Forewing: apex and terminal margin somewhat narrowly black; a subterminal black, zigzag line; a broad, bright yellow, discal, transverse band with somewhat irregular, sinuous margins defined by obsolescent blackish lines and medially traversed throughout its length by a narrower brown band bearing a transverse superposed row of obscure, diffuse, dark spots; beyond the discal band is a transverse series of broad, light, lunular markings. Hindwing: differs little from the forewing in markings. *Underside* ochraceous drab; the discal band as in the male but lilacine white, inwardly bordered by a sinuous, pale brown, narrow band, a transverse, sinuous, narrow, subbasal pale, brown band and short, similar bands defining the apices of the cell areas in both wings; beyond the discal band the transverse series of spots and the subterminal and terminal markings similar to those in the male but the latter much paler. Exp. 63-83 mm.

The transformations of the species have not been chronicled, but they will probably not differ much from those of the next, *C. thais*. The habits are not known either. The distribution is "Sikhim; Behar; Assam; Burma; Tenasserim; the Andamans; Malayan Subregion to Java."

69. Cirrhochroa thais, *Fabr.* *Wet-season form.*—The male has the *upperside* rich tawny with the following black markings:—Forewing: a narrow band along the discocellulars; three transverse spots in the interspaces beyond; a spot at the base of interspace 3, short transverse, slender lines in continuation of it in spaces 1 and 2; the three spots beyond the apex of cell in echelon forward of the last-mentioned three markings; a postdiscal transverse series of lunules inwardly diffuse in spaces 5 and 6, obsolescent in space 1; the apex and termen broadly black, the latter coalescing with an obscure, transverse, subterminal, lunular line and enclosing a series of detached obscure lunules of tawny ground-colour sometimes completely wanting. Hindwing: the markings dusky black, very similar to those on the hindwing of *C. mithila*; the white, subcostal patch on the outer margin of the discal line as in that form, but more prominent; the costal margin beyond it to apex fuliginous grey. *Underside* dark ochraceous tawny suffused with purplish; basal area with some short, slender, trans-

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verse, dark lines; the discocellular transverse streak on the forewing as on the upperside; a prominent, transverse, discal band across both fore and hindwings, very broad at costa of forewing, narrowing to dorsum; similarly, but not quite so broad at costa of hindwing, narrowing to the dorsum, its inner margin sinuous, its outer straighter, both obscurely defined by dark lines; faint lunular markings beyond on terminal half of both wings; the black spots in the transverse discal series on the hindwing very small. Antennæ brown; head and abdomen more or less fulvous tawny; thorax with bright pale green pubescence; beneath pale ochraceous. Sex-mark: the veins on the upperside of the disc of the forewing black; veins 5, 6 and apical portion of 7 with very narrow short bands of specialized scales on each side; no such scales on the hindwing. Female *upperside* similar, the black edging to the apex and termen conspicuously broader as are all the black markings. *Underside* similar; ground colour paler, more ochraceous, not suffused with purplish, the markings similar to those in the male, but the inner margin of the discal band more than sinuous, zigag; Antennæ, head, thorax, abdomen as in male.

Dry-season form.—Similar to the wet-season form but on the upperside the ground colour is a shade duller and paler, the markings more restricted and of a dusky black. On the underside the transverse discal band is sometimes margined outwardly with a diffuse dusky black band, the white being sometimes completely obscured by a suffusion of the ground colour.

Larva.—The larva is similar to that of *Cupha* in general aspect, the body being set with spines in the same way. The head is round and slightly bilobed, yellow in colour, shiny, smooth, with two exclamation-marks, half the length of face, down each lobe and some markings about the eyes, black. Segment 2 is narrower than the head by a good deal and is yellow in colour with a dark dorsal line. Spiracles are large, oval, black with a light central slit, shiny, the lower half hidden often by a fold near base of subspiracular spine. On segments 2 and 3 there is a subdorsal and lateral setiferous spine on each side about 7 mm. in length; on segment 4 there is a subdorsal one and a lateral one near front margin; segments 5-12 have each a subdorsal, lateral and subspiracular setiferous spine on each side; segment 13 has one subdorsal on each side, the anal segment one, lateral, before the hinder margin. The spines are all equal in size and black in colour, shiny, except the anal four which are white; anal segment is yellow. Colour of the body is dark-brown with a violet tinge and with a subdorsal, lateral and subspiracular white longitudinal line, the spines being placed between these lines; abdomen green. L: 25 mm.; B: 6 mm.

Pupa.—Is similar in shape to that of *Cupha*, but is bone-white all over in colour and has many more curved processes. Head with very prominent eye-balls underneath, rounded moderately at sides, rather bowed ventrally; a small point in front of each eye curving upwards; segment 2

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indented in centre of front margin, flat on dorsum with a subdorsal "boss" on each side, each giving rise to a 6 mm. long, stiff, outwards-curved spine; thorax moderately high, convex, slightly carinated in dorsal line, the carination splitting into two at centre of segment backwards; there is a subdorsal, central spine similar to that of segment 2 on each side; segment 4 has similar though slightly shorter spines; segment 5 has them also, but a good deal smaller again; segment 6 also, twice the length of those of segment 5; segment 7 has a subdorsal spine twice the length of that of segment 6 and a lateral one besides, curved forwards, the same length as the thoracic subdorsals; the surface of the pupa is covered with minute hooked hairs and is slightly rugose. The shoulder is produced into a flattened point or tooth; the wings are expanded somewhat along thorax and segments 4, 5. Spiracles dull, oval, rather large, black, with a light central slit, the hinder ones being half covered by the hinder margin of preceding segment. Colour of pupa is whitish grey with the following black spots; segment 2 with two spots in front of each spine, four spots on the flat part of each shoulder-tooth, two spots along wing-line on segment 4; a semicircle of four spots with hinder margin as base on segment 5; a similar semicircle on segment 6 besides four between wing and spine on each side; segments 7-12 with a similar semicircle of spots, segment 7 having two spots between the spines on each side and one at junction of wing and segment. The size of the pupa is variable, but has much the same proportions as that of *Cupha*, though generally somewhat larger.

Habits.—The larva feeds upon young leaves, grows fast, eating voraciously, sits generally with all the segments contracted on the underside of leaves and is very active, running about at a great pace; when suddenly disturbed, it lets itself fall by a thread by which it pulls itself up again when the danger is past. The larvæ are much ichneumoned; they eat their cast skins after moults. The pupa is formed against a perpendicular surface, generally low down in a shady situation and hangs parallel to the surface, being firmly and rigidly attached. Occasionally, of course, it is found suspended from the under-surface of a leaf, horizontal or otherwise. The larva objects strongly to the hot sun. The butterfly is found only in the hills but is very plentiful where it occurs, and will certainly be met with at Matheran or Mahableshwar, also probably in Thana District; it is quite common further south on the Western Ghats and extends thence to Ceylon. It is confined to these places. The insect likes the neighbourhood of evergreen jungles and damp nallas, and keeps entirely to wooded parts, ven-

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turing but rarely into the open. It is never seen basking on the tops of hills, for, like its larva, it is not partial to the sunlight, except when diluted through the dense shade of trees. It is a fast flying active insect, generally, seemingly, on the wing and very busy either, in the case of males, looking for females or, in the case of the latter, choosing a fit leaf whereon to deposit an egg or two; these are laid generally on the underside, but often, also, on a shoot, stem or even, if conveniently situated, on a dead creeper-stem or dry twig. The style of flight is that of *Cupha*, though stronger and faster; the insects bask on leaves in shady places with their wings half open; they rest with them closed over the back. They do not visit flowers much. They may be found in great numbers round their food-tree in the monsoon months. This tree is *Hydnocarpus wightiana*, Blume, of the botanical family *Bixineæ*, common in the evergreen forests of Kanara and the Konkan generally, the large woody brown fruit of which yields a yellow oil used in native medicine for skin diseases; it is also used for lighting purposes.

The genus *Cirrhochroa* contains seven species, according to Bingham, occurring in British India; others are found in the Malayan region.

70. Byblia ilithyia, *Drury.—Wet-season form.*—Male *upperside*: deep orange. Forewing: the costa broadly jet-black to within a short distance of apex; cell crossed by three narrow, short, black bands, the inner and the outer not reaching the median vein; a very irregular, black, discal blotch from dorsum to vein 4, continued very narrowly along that vein to meet an oblique, irregular band, from just beyond the middle of the costa; a post-discal, broad, transverse, black band from dorsum to vein 5, with the portions of the veins beyond it defined in black. The apex of the wing beyond the broad black edging to the costal border has its upper margin and the terminal portions of the veins defined in black; finally a narrow terminal band. Hindwing: an elongate black, subcostal patch near base, continued posteriorly across the cell by an inner and outer series of small transverse spots; a complete, broad, black, postdiscal band with the portions of the veins beyond it lined with black, and a narrow black terminal band as on forewing. Cilia of fore and hindwings white, alternated with brown. *Underside*: paler orange. Forewing: black markings as on the upperside, but the cell and upper discal markings obscurely margined on both sides by white; an oblique, black line from costa to apex of postdiscal transverse band, followed by an oblique, preapical series of

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diffuse white spots, the terminal black band as on the upperside but traversed by a broken white line. Hindwing: a subbasal and a discal, broad, transverse, white band, both bordered inwardly by a series of black spots and outwardly by a broad black line; a somewhat narrower, postdiscal, transverse, black band traversed by a series of paired white spots, followed by a row of cone-shaped marking of the ground colour, the apices of the cones turned inwards and broadly white; finally a black, terminal band traversed by a series of white lunules. Antennæ black; head, thorax and abdomen dark dusky, fulvous red; beneath, palpi white, head, thorax and abdomen dark ochraceous, variegated with some black lines and spots.—Female similar, with similar markings, but on the upperside the ground colour is paler, the black markings narrower. Forewing: the postdiscal black band nearly complete, interrupted only in interspaces 1 and 4; the terminal black band traversed by a broken white line. Hindwing with no subcostal black patch, instead three series of transverse spots; a postdiscal, transverse, broad, black band bordered inwardly by a series of slender black loops; between these and the postdiscal band a series of spots of the ground colour; the terminal black band traversed, as on the forewing, by a whitish broken line. *Underside*: similar to that in the male, but the ground colour paler. On the forewing the black markings comparatively narrower, less-well defined; on the hindwing the white on the bands and spots replaced by pale yellow.

Dry-season form.—Male and female *upperside*: similar to that in the wet-season form; black markings on the whole not so sharply defined. *Underside*: ground colour darker; on the hindwing dark ochraceous; the transverse subbasal and discal bands in both sexes white. *Exp.* 50-56 mm.

Larva and pupa.—In Khandesh and the Deccan the larva has been reared along with those of *Ergolis* on *Tragia cannabina*, L. It was possible to distinguish them only by the fact that the light dorsal line was continued the whole length of the body in this species and was comparatively uninterrupted. The pupa was undistinguishable.

Habits.—The habits of the larva and pupa are the same as for *Ergolis*; those of the imago also, though this species inhabits the plains and is not found in the hills in forest country. The butterfly is a weak flier like *Ergolis*, and is generally found about the foodplant of the larva; it does not fly far and rests with its wing closed over its back and the forewings drawn in between the hind wings. It basks low down near the ground on leaves, &c., with the wings horizontally expanded. It occurs in Central and Southern India and Ceylon.

This is the only species found within the limits of British India, but there are others in Africa.

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71. Ergolis ariadne, *Johanssen.* (Pl. F, fig. 36).—Male and female: forewing truncate at apex; termen angulated at interspace 5 and again at apex of vein 3, concave between; tornus obtusely angulate. Hindwing: termen more or less deeply scolloped. Male *upperside*: ochraceous rufous: a prominent white, small, subcostal spot before apex of forewing; two or three dark brown marks in cell of both fore and hindwings, followed by subbasal, discal, two postdiscal, subterminal and terminal slender, sinuous, dark brown lines, crossing from costa of forewing to vein 1 of hindwing; discocellular nervules of both wings defined by short, dark brown lines; cilia white, alternated with brown. *Underside*: ground-colour brown with an ochreous tint, and sometimes a slight greyish suffusion. Fore and hindwings: some dark chestnut-brown spots or loop-like marks at base, followed by subbasal, discal and post-discal, broad, chestnut-brown, sinuous bands, interrupted on the forewing by the sex-mark of specialized scales (the subcostal vein and veins 6 and 7 on the upperside of the hindwing are prominently pale and shining and there is a large, discal patch of specialized, very dark, shining scales on the underside of the forewing extending to the base of wing, upwards into the cell and to vein 4); the postdiscal band on the hindwing traversed by series of transverse, dark spots in the interspaces. Lastly, both wings crossed by a subterminal zigzag and a terminal, irregularly sinuous, dark brown line. Antennæ, head, thorax and abdomen ochraceous rufous. Female similar, slightly paler in colour, of course without the specialized sex-marks. Exp. 52-56 mm.

Larva (Pl. I, fig. 11).—The larva is like those of *Cupha, Atelia,* except that the head is furnished with a pair of long horns; the colour is black with a striated white, broad, dorsal band on segments 6—11. Head square from front view, rather small, with two very divergent, long, hard, cylindrical horns, one from the vertex of each lobe, as long as segments 1—4 together, in the plane of the face, set with a cluster of short spines at tip and a few along the shafts; they are separated widely at base and more or less squarely; the surface of head is smooth except for two rows, of spines one slightly anterior to the other, down each cheek; a few hairs about jaws; colour of head is black. The body is cylindrical with the segments well marked; anal segment high, overhanging the anal prolegs or claspers; neck narrower than head. The body spines are all more or less of the same size, except the subspiracular ones which are small; the pedicels or shafts of the subdorsals of segment 4 and segment 12 are thicker than others; the spines of segment 2 are also small; each spine consists of a shaft from the extremity of which proceed three or four fine, sharp, smooth spinelets at an angle of 45° to the shaft; all spines are perpendicular to the surface of body and slightly swollen at the origin; they are arranged as follows:—segment 2 has a subdorsal, simple one and a lateral and subspiracular spine branched at extremity into four points: the subspiracular spine on base of leg; segments 3 and 4 have a

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similar arrangement of spines, all branched at extremity; segments 5—10 similar; segment 11 has a dorsal, subdorsal and subspiracular one as well as another underneath this last; segment 12 is similar to segment 11 except that the last spine underneath the subspiracular is wanting; segment 13 is very narrow, a mere strip, and is quite bare; segment 14 has a lateral spine on hinder margin; there is a small spine on base of prolegs 7—10 and one in a similar position on segments 5 and 6; the lateral spines are really nearly supraspiracular. The surface of the body is covered with transverse rows of minute setiferous tubercles besides the spines. The spinelets at extremity of shafts are nearly as long as the shafts themselves. The spiracles are small, oval, flush, black, those of segment 12 conspicuously larger. The colour of the larva is dull black with a short, diagonal, subspiracular, white band near the hinder margin of each segment and a broad dorsal band composed of short lines at right angles to the longitudinal axis of larva on segments 6—11, besides a transverse row of fine dots just before the hinder margin of each segment, all white; belly red-black; legs shiny black. L: 22 mm.; B: 9·4 mm. with spines; L of spines: 2 mm. with spinelets; L of head—horns: 5 mm.

Pupa (Pl. I, fig. 11*a*).—The pupa is slender with the wing-cases somewhat dilated, a dorsal protuberance and two small head-points; colour variable, generally green. Head trapeze-shaped seen from above, with two divergent, laterally compressed points, one from each eye, directed forwards, ridged on top (dorsally), separated by a sinus in front of head which reaches the front margin of segment 2; these points are well developed and conical. Segment 2 has the front margin curved in a semicircle and a waved hinder margin, is flat dorsally and fairly broad between the margins. Thorax is carinated in dorsal line on the anterior half which is inclined at an angle of 45° to the longitudinal axis; it runs up into a point and is flat on the dorsal decline from this point to hinder margin, this decline being in a plane nearly perpendicular to longitudinal axis of pupa: so that the point (apex of thorax) is a triangular pyramid of which the lateral slopes are also nearly flat. The pupa is a good deal broader at shoulders than at segment 2 with a short, low ridge on each shoulder; the wings are expanded from just behind shoulder, first in a little semicircle, the lateral outline of pupa then running concavely to lose itself in dorsum of segment 5, to widen out again in a curve at segment 6 which finally runs into the general level of body ventrally about segments 7 and 8; the constriction between segments 4 and 5 is considerable dorsally because of the high thorax-apex and a dorsal tubercular rising on segment 6. The body is as broad at segment 7, owing to the wing-expansion at shoulders, as at shoulders, perhaps a little broader; section of abdomen from segment 8 to anal end is circular; the cremaster is short, strong, square, with two large extensor ridges and with densely disposed suspensory hair-hooklets at

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extremity and dorsally ; ventral line of wings convex from segment 8, thence to anal end, straight. Spiracular stigma of segment 2 hardly apparent ; rest of spiracles oval, not particularly small, nearly the same colour as the body, with a central, raised, light brown slit. Surface of pupa dull, irregularly transversely aciculate-lined on abdomen. Colour of the body is a dark olive-green ; apex of thorax shortly yellow ; a green-black, dorsal, triangular patch on segment 9 ; the dorsal edges of wings as well as the lateral margins of segments 1 and 2, the centre of front dorsal slope of thoracic pyramid and a broad dorsal abdominal band speckled densely very light green ; antennæ whitish. L : 18 mm. ; B at segment 6—7 : 7 mm. ; at shoulders : 6 mm. ; H. at apex of thorax : 5 mm.

Habits.—The egg is generally laid on the upper side of a leaf ; the larva lives on the upper side, making a slight bed of silk, at first anywhere, afterwards in the centre along the midrib ; it eats much, grows fast and is very active ; it lies full stretched with the horns held straight out in front which means that the face is bowed down and applied to the leaf-surface. It wriggles when touched roughly, but does not, as a rule, leave its resting place. It walks fast, moving its head from side to side, spinning silk as it goes. The pupa is formed from the underside of a leaf or from a twig and hangs perpendicularly down or at an angle, as it is rigidly fixed to the pad of silk woven for the purpose by the copious suspensory hooklets ; it also wriggles from side to side when touched and will stay bent from segments 9 and 10 for a long period after being disturbed. The butterfly is a weak flier and keeps generally to a circumscribed area in the vicinity of its food-plant ; it flies for a short distance at a time only, always low down near the ground within easy reach of a net and is easily captured ; the style of flight is a series of ups and downs with the wings held horizontally open between each ; it basks with them thus held open, though it rests with them closed in rainy weather and at nights. The insect is common everywhere throughout India in the plains and in the hills, in the open country and in the jungles wherever the food-plant of the larva is to be found. This plant is a creeper of the family *Euphorbiaceæ*, called *Tragia involucrata, L.* ; the larva also feeds upon *Tragia cannabina*, L., both with nettle-like leaves covered with little urticating hairs which are not always comfortable to touch. The former is more or less confined to regions of heavy rainfall and the hills, while the latter grows in the drier parts of

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the open country. This butterfly is found throughout Continental India, east of Mussoorie in the Himalayas and of the Punjab; also in Ceylon, Assam, Burma, Tenasserim, and extends to the Malayan Subregion and China. The figure of the butterfly in the coloured Plate is too red, and the patch of specialized scales on underside of forewing too dark; interspace 8 on upperside of hindwing should be grey as far as it is visible in the picture.

72. Ergolis merione, *Cramer.—Wet-season form.*—Male *upperside* brownish ochraceous. Fore and hindwings crossed by slender, somewhat obscure, very sinuous or zigzag, dark, basal, two subbasal and two discal lines, disposed in pairs, followed by a single, sometimes double, postdiscal and a single subterminal, slender line. All these lines more or less interrupted anteriorly on the hindwing which has a smooth, unmarked, uniform appearance from the costa to subcostal vein and vein 5. On the forewing there is in addition a series of obscure spots between the postdiscal and subterminal markings and a small, white, subcostal spot before the apex. *Underside* much as in *E. ariadne*, but the transverse chestnut bands broader, more diffuse. Antennæ, head, thorax and abdomen brownish ochraceous. Sex-mark on the underside of forewing as in *E. ariadne*: no sex-mark on upperside of hindwing.—Female similar, but on *upperside* the transverse lines broader, more diffuse, with a greater tendency to form bands; the postdiscal line always double, forming a band traversed by a series of dark ochraceous spots in the interspaces; these lines and bands continuous, not interrupted anteriorly on the hindwing as they are in the male. *Underside*, except for the sex-mark, as in the male.

Dry-season form.—Male and female *upperside*: ground-colour much paler, the transverse lines more distinctly in pairs, forming bands, the ground-colour between each pair more dusky brown. *Underside*: similar to that in the wet-season form, but the ground-colour paler, the bands more diffuse. Exp. 52—62 mm.

Larva.—" Cylindrical, slender; segments armed with two dorsal and two lateral rows of short, branched spines; head with a pair of long, straight, branched spines. Colour green with longitudinal dark-brown lines." (*Moore*).

Pupa.—Moore also gives the pupa as "similar to that of *E. ariadne*." It is not likely that the larva or pupa differ much from those of the next insect, *Ergolis taprobana*, which Bingham treats as a race of the present one, but which has here been kept as a separate species.

This species is not likely to differ in any important particular as regards the habits in any stage from the next to which it is so closely allied. It is found in the northern half of Continental India, in the Himalayas from Simla to Sikhim and has been recorded from Rajputana and Bengal, Assam,

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Burma, Tenasserim and the Malayan Subregion. The Tenasserim specimens are dark and often without the white subcostal spot on the forewing, approximating thus to the Southern Indian and Ceylon *E. taprobana* according to Bingham. The food-plant is nearly certainly *Tragia cannabina*, L., though it is nowhere recorded as far as is known.

73. Ergolis taprobana, *Moore.*—This differs as follows from the last :—*Wet-season form.*—Male *upperside* with the ground-colour dark ferruginous ; white subcostal spot on forewing rarely present ; the transverse lines black, more clearly defined ; the anterior half of the hindwing as in *E. merione* smooth, uniform, unmarked. *Underside*: with the ground colour darker than in *merione*, the markings on the anterior half of the forewing and in the centre of the hindwing obscured by a superposed, very dark chestnut shading ; on the forewing this dark shading does not extend to the base, apex or termen ; on the hindwing it does not extend quite to the costa. Sex-mark as in *merione*. Female similar to the female of *merione* but differs as follows :—*upperside* : the ground-colour lighter ferruginous than in the male ; the transverse lines and markings very distinctly defined ; the two postdiscal lines formed into more or less broad cordate marks in the interspaces. *Underside* : ground colour darker than in *merione* female, sometimes a sort of purplish brown ; the chestnut transverse bands well defined and continuous on both fore and hindwings.

Dry-season form.—Male and female similar to the wet-season form but the ground-colour paler. Exp. 49—56 mm.

Larva.—The caterpillar is exactly the same as that of *E. ariadne* in shape of body, arrangements of the spines, their shape and size and the shape of head. Surface of body covered with transverse rows of minute yellow tubercles, each bearing a little seta. Spiracles rather large, oval, the colour of the body, bordered thinly with black. The colour of the body is green with a broad, subdorsal, yellow stripe flanked by a double, interrupted, yellow line ; segments 7 and 11 suffused dorsally with dark-brown ; bases of subdorsal spines of segment 4 brown ; belly light green ; the spines all blue-green and shiny. L: 27 mm. ; B: 4 mm. without spines ; L of head-horns : 5 mm.

Pupa.—The pupa is similar to that of *E. ariadne* in shape and size. It can be separated from that species by the outer margins of the wings being straight instead of slightly waved as it is in *ariadne*. Surface very slightly shiny, smooth. Spiracular stigmata of segment 2 hardly accentuated ; other spiracles oval, not small, colour of the body. The colour is generally light green, veined densely on wings with brown ; head points, carination of thorax, lateral wing outlines also brown ; Suspensory hooklets bright golden-brown. L : 18 mm. ; B : 6 mm. at segment 7 ; 5·25 mm. at shoulders ; 2 mm. between head points ; H : 5 mm. at thorax ; 6 mm. at segment 6.

Habits.—The habits of oviposition are similar to those of *E.*

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ariadne; also the habits of the larva and pupa and the imago or perfect insect. This last inhabits the hills and jungles in regions of heavy rainfall generally, although it encroaches on the Plains along the borders where the climate is comparatively fairly dry. It is confined to Southern India and Ceylon. The plant it has been reared on in the caterpillar stage is *Tragia involucrata*, L., mentioned already as one of the species upon which the caterpillar of *E. ariadne* feeds.

Ergolis contains only the above three species in British India but there are others in the Ethiopian and Malayan Regions.

SUB-FAMILY *ACRÆINÆ*.

Only one genus .. .. *Telchinia*.

GENUS *TELCHINIA*.

Only one species. Exp. 2·1″—2·53″ .. .. *violæ*.

The species will be found figured on coloured Plate E, figures 31, male, 31*a*, female. The figures are good; in the female, however, the spots left in the coalescing basal black markings on the hindwing are not light enough.

The sub-family is chiefly African, very few species existing in South America and only two in British India. There are, however, a few in the Malayan Subregion nearly related to our Indian ones. *Pareba vesta* occurs in the Himalayas and extends in the hills eastwards to China and south into Burma. *Telchinia violæ* is confined to Peninsular India but is found every where in the area, even in the dry region of Sind where it is not uncommon. There are 200 species in the group and they are all protected insects, exuding a yellow oily, disagreeably smelling liquid from the joints of the legs in self-defence, shamming death when handled, and as regards *Telchinia* and *Pareba* resembling *Danainæ* in shape and colour as well. The colour of the two Indian species is yellow, or tawny suffused with reddish, marked with black spots; the hindwing with a black, yellow spotted border; the whole somewhat oily looking. The flight is weak, slow, fluttering, the wings never being moved far from horizontal; the insects keep near the ground and go straight ahead; they do not bask and rest with their wings closed over the back. They frequent flowers. The larvæ and pupæ are very similar.

DESCRIPTION OF SPECIES OF ACRÆINÆ.

Telchinis violæ, *Fab.* (Pl. E., figs. 31 ♂, 31*a* ♀).—Male *upperside* tawny, with a roseate tinge. Forewing: a transverse spot in centre of cell, another larger along discocellulars, a discal series in interspaces 1, 3—6, 10, the apex and termen, the latter narrowing posteriorly with projections inwards along

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veins, all black. Hindwing: a basal series of four or five spots, one in middle of cell, a subcostal one above it, a discal series of obscure spots, a postdiscal dot in interspaces 3—6, and a broad terminal band including a series of spots of ground-colour, all black or blackish showing through from underside. *Underside*: ochraceous yellow or paler tawny, forewing paling to apex with the markings as on the upperside. Hindwing with the same markings as upperside but with the spots more clearly defined, the spots on terminal band large and yellowish white, the band bordered diffused whitish, the roseate tinge stronger, the basal black spots coalescing, leaving whitish spots between, antennæ black; head and thorax black, spotted with ochraceous and white; abdomen black at base, yellowish, with narrow black bands; beneath: the palpi, thorax and abdomen ochraceous, thorax spotted black, abdomen with black longitudinal line at base.—Female similar; *Upperside*: ground-colour somewhat oily looking, duller; black spots on both wings larger, upper discal ones often coalescing; the spots in terminal band of hindwing larger and whitish. *Underside*: ground-colour much paler and duller, markings same as upperside but better defined. Exp. 53—64 mm. Female the larger.

Egg.—Is echinoid in shape, a little higher than broad with 17 raised, transversely striated, longitudinal ridges not meeting on top, the top being shallowly reticulate. Colour shiny yellow.

Larva.—The body is cylindrical in shape with the segments well marked, anal segment high, flap rounded at extremity, not overhanging the claspers, in a plane perpendicular to longitudinal axis of larva; the prolegs are long and moth-like. Head small, round, set with erect hairs, brownish orange, with a triangular clypeus which has the apex black; a black spot at base of each cheek. Segment 2 has a subdorsal spine and a lateral tubercular rising; on the common margin of segments 2 and 3 is a lateral spine; segment 3 has a subdorsal spine with a lateral one on the common margin of it and segment 4; segment 4 has a subdorsal spine; 5—12 have each a subdorsal, supra and subspiracular spine; segment 13 a subdorsal one and 14 a dorso-lateral one; there is also a small chitinous surface or spot on segments 3—10, under the subspiracular spine with bristles from it. All spines are shiny black set with erect, stiff, black hairs arising from thickened bases; all are about the same length except those of segments 2, 3, 13 and 14 which are slightly shorter. Colour is greasy claret brown with segments 2 and 14 yellow reddish; dorsal portions of segments 3, 4, 11 and 12 are yellow; ventrum greeny yellow; legs shiny black; the feet of pseudolegs green; a shiny black shield on base of pseudolegs. L: 21 mm.; B: 10 mm. with spines; 4 mm. without spines; L of spines: 3 mm.

Pupa.—Elongate, slight, head with two blunt points, anal end bluntly rounded. Head quadrate, the front margin straight between two conical short, stout teeth or points directed straight forwards; convex above and below, parallel sided. Segment 2 is the same breadth as head being a

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broad band with dorsum in same plane as head vertex. Segment 3 same breadth as segment 2 in front, broader about middle because of the prominent shoulders; the dorsal line of segment rises at nearly a right angle to plane of segment 2, then rounds off suddenly to become nearly parallel to longitudinal axis of pupa, rising only slightly to the apex which is nearly over the posterior margin. Segment 4 forms part of the hinder slope of the thorax, so that segment 5 is the lowest point of the dorsum after which the transverse section of abdomen is a slightly increasing circle up to segment 8, afterwards decreasing continually to anal end which is bluntly rounded, the last two segments forming a nearly perfect hemisphere bearing a short stout cremaster. The surface of the pupa is dull, very slightly wrinked and set with minute erect hairs. The colour is white with a pink and yellow shade in it; segments 2—5 have a subdorsal broad interrupted black line coalescing at the hinder margin of the last segment, the extremities in front being joined by a straight line on the vertex of head; the dorsal space between these lines on segments 3 and 4 is reddish yellow; the abdomen has a broad subdorsal line, a similar spiracular line and a central ventral one: all black; each of these lines or bands enclose a reddish yellow circular spot near front margins of segments, these spots being the scars left by the larval spines (except the ventral spots); last segment and cremaster are black; tips of head points, sides of head, shoulders, antennæ and greater part of proboscis also black; wings margined black with a central bifurcated black mark to each and a short subapical line; all the black markings are dull, not shiny. L: 17 mm. B: 6 mm. at broadest part.

Habits.—The eggs are laid in a batch, up to 15 or so in number, on a young shoot or tendril; the larvæ are gregarious at first but separate in the third stage; they are extremely lively and moth-like in their movements and grow very fast; they generally sit on the underside of a leaf though by no means always, pupate generally on or near the food-plant, the pupa hanging perpendicularly down by the tail like all nymphaline pupæ, freely, though firmly, attached. The larva, pupa and imago have a disagreeable odour. In Bombay the butterfly is to be found at all seasons, in the mountains and plains, forests and open country, even in the region of least rainfall—Sind. The flight is that given for the sub-family. The food-plant is *Modecca palmata*, Lam., in the damper parts, the wild Passionflower, but the larva will also feed on cultivated kinds, perhaps even on certain *Cucurbitaceæ*, these being near allies of the Passionflowers. The butterfly is

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confined to Peninsular India and Ceylon, and is fairly plentiful everywhere, in these places.

SUB-FAMILY *Libytheinæ.*

Only one genus.....*Libythea.*

GENUS *Libythea.*

Only one species, Exp. 1·8″—2·3″ .....*myrrha.*

This sub-family is composed of the single genus containing some score of species spread throughout the world in Europe, Africa, India, the Malay Archipelago, N. and S. America, Mauritius and the Antilles. In India Colonel Bingham records 5 species and 3 races and of these only the one species is of interest to us; and it is nowhere plentiful. The libytheine butterflies are all very like each other, somewhat like some of the *Vanessæ* in shape and are brown with yellow or white markings on the upperside; the underside shaded and striate-punctate grey; they are fond of water and damp places and of the sun, basking generally on the upper end of a dead twig or bit of stick with the wings closed over the back and the fore-wings sunk between the hinder pair so as to show nothing but the protectively coloured grey parts. They are then very difficult to see. They fly well but not for long, going fast in a jerky, skipping way, and dodging from side to side. They are insects of woodlands and the hills. The egg, according to Doherty, is shaped like a bottle and is ribbed longitudinally; in fact, resembles that of the *Pieridæ;* the larvæ may be said to resemble those of the *Pieridæ* also; those of two species known certainly do so; the pupa is nymphaline in aspect and character of suspension; more particularly, like that of *Apatura, Euripus*: rigid, with the body parallel to the surface on which it is fixed. The food-plant of two species, one spreading west to Europe, the other east to China and Malay, is *Celtis*, a genus composed of trees belonging to the family *Urticaceæ.*

DESCRIPTION OF SPECIES OF LIBYTHEINÆ.

Libythea myrrha, *Godart* (fig. 5).—Male and female *upperside*: ground-colour dark-brown. Forewing: a streak from base along median vein, extending narrowly on each side of it and continued beyond as a large oval spot in interspace 2, two preapical double spots placed obliquely towards costa: orange-yellow. Hindwing: a slight, oblique, narrrow, medial band from vein 1 to vein 5 of the same colour. *Underside* forewing: ground-colour brown; orange-yellow markings as on upperside, but broader and more diffuse; apex and dorsal margin broadly shaded pale grey irrorated with minute dark spots and transverse short striæ. Hindwing greyish-brown irrorated with minute dark spots and transverse short striæ, shaded in the cell, on the middle of costal margin and on middle of termen with diffuse brown; the lower half of cell in hindwing darker in the male; the whole

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hindwing much more concolorous in the female. Antennæ, head, thorax and abdomen dark-brown; beneath: palpi, thorax and abdomen greyish-brown. Exp. 46—58 mm.

This is a variable insect in the extent and breadth of the orange-yellow markings and in the mottling and ground-colour of the underside. The variety *sanguinalis*, chiefly Himalayan and Eastern, has the orange-yellow markings very broad. Variety *rama*, the variety occurring in South India and Ceylon, is smaller with the markings much narrower and shorter, the preapical spots white or yellowish-white.

Larva.—In general facies the larva recalls that of *Catopsilia* of the *Pieridæ*. It is dark-green in colour, cylindrical in shape, narrowing somewhat to both ends; the head is small, about half as broad as the larva at centre: and is about the same breadth as segment 2. The head is round in shape, with a shallow broad depression on vertex; the surface is smooth and dull, sparsely set with minute dark bristles and some light hairs about jaws; it is green in colour, with brown markings seen under the lens, the antennæ reddish, labrum green, eyes black. Segment 2 is broader behind than in front and has the front margin very slightly triangularly produced in dorsal line; the anal flap is rounded behind, with the curve of its dorsal line nearly a quarter-circle, the extremity nearly touching the resting surface; and there is a depressed dorsal surface, oval in shape, two-thirds the width of segment, reaching from hinder extremity towards front margin: this surface is hairless and covered with brown streaks. The rest of the larva is covered with transverse rows of minute, black bristles, four to each segment; there are also some bristles on ventrum; the rows are separated by depressed lines, one between each. The prolegs are rather long. The spiracles are light yellow, black-rimmed, oval, flush with the surface and of ordinary size. The colour is dark-green, sometimes with a brownish tinge, with a thin, light yellow, dorsal line from segment 4 to segment 12 and a narrow, yellow, supraspiracular band from head to anal end. L: 26 mm.; B: 4·5 mm. at middle; B at head: 2·25 mm.

Pupa.—This is most like that of *Ergolis* but has no head-points. It has the part formed by the head and segment 2 straight in front (front of pupa), parallel-sided, convex on dorsum transversely to pupa; the shoulders are the broadest part, widening out suddenly at an angle of 135° with the side of head-piece; the dorsal outline seen from the side is, for the thorax, a carination starting from front margin in a straight line at an angle of 45° to longitudinal axis of pupa, culminating in a rounded apex just over the hinder margin to which the outline descends abruptly; thence the line ascends again to the apex of a small, sharp peak at the common margin of segments 5 and 6, to descend again in a slight carination to the hinder margin of segment 8 after which the outline curves in a quarter-circle to end of cremaster; the ventral outline is

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nearly straight from head to segment 12, then nearly at right angles; the lateral outline after the shoulders is formed by the wings being expanded very slightly for a short distance, after which the sides converge to meet at the cremaster; the transverse section of abdomen after segment 8 is circular; the abdominal peak is somewhat higher in appearance than the thoracic peak; the cremaster is triangular seen from above and embraces the last segment somewhat, its attachment surface being considerably longer, in the sense of the pupal length, than broad. Surface of pupa is smooth and somewhat shiny, a thin line or carination connects the shoulder with the abdominal peak. Colour is light green with the tops of carinations yellow, and a black speck on abdominal peak. L: 12·5 mm.; B: 5 mm. at shoulders; 3 mm. at front of head; H: 6 mm. at abdominal peak, 5 mm. at thoracic peak.

Habits.—The eggs are laid on the shoots and young leaves, generally of a small tree or shrub near a water-course or in some damp place open to the sunlight, though in forest. The larvæ generally live on the undersides of the leaves, eating all but the ribs or veins in a moth-like way, and on these ribs and veins they may generally be found sitting. They emit much silk or web and fall to the ground by a thread when disturbed, but only when actually touched or otherwise violently molested; they rest with the true legs off the surface, in the air, bunched, the head curved down and often turned to one side. The pupa is formed on the underside of a leaf and the body lies quite parallel to the surface like the pupa of *Elymnias*. The imago is not often seen except in the neighbourhood of the food-plant and, even then, but rarely. This is probably a good deal due to its way of resting and the colouration of its under parts which blends so well with the colour of the grey and brown barks of dead sticks and twigs (see the method of resting above under genus.) Its distribution is throughout the Himalayas from Kulu to Sikkim; Western India; Bombay; Southern India; Ceylon; Assam; Burma to the Malayan Subregion and China. It is not a butterfly of the plains at all. It is found in Kanara and may probably turn up at Matheran or Mahableshwar where the food-plant *Celtis tetrandra*, Roxb., surely occurs.

FAMILY NEMEOBIIDÆ.

Only one genus .. .. *Abisara*.

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GENUS ABISARA.

Only one species. Exp. 1·6″—2″ .. .. .. *echerius.*

This species is figured on coloured plate F, figures 40, male, and 40*a*, female. The colouring of both figures is not brown enough, there is too much red in it. The violet gloss on the upperside of male is very good.

The greater number of the relations of *Abisara* are found in Tropical America, some 960 or 970 species. There are 30 or 40 Eastern species, 20 of which occur in British India. One single species occurs in Europe, including England: *Nemeobius lucina*, the Duke of Burgundy Fritillary. These insects are evidently closely related to the *Lycænidæ*, at least they are nearer to them than to any other division of butterflies in all their stages, to judge by Indian representatives and *Nemeobius*. The egg, according to Doherty, is lower than wide, smooth, granulate or prickly, but not reticulate or radiate in the genera examined by him. The larvæ of three out of five Indian genera and of *Nemeobius* are distinctly lycænine in shade, except that the head is not hidden; and the pupæ are certainly more like those of the 'Blues' than anything else. Finally the facies of the imagines is also lycænine. *Nemeobius* and *Dodona*, a Himalayan genus, both contain butterflies that rest with their wings closed over their backs while *Abisara* always keeps them half open, indeed cannot completely close them as the hindwing is not all in one plane, being somewhat warped as it were. The Duke of Burgundy Fritillary is said not to affect flowers and to be fond of shady places. The same is the case with *Abisara*.

DESCRIPTION OF SPECIES OF *NEMEOBIIDÆ*.

Abisara echerius, *Stoll.* (Pl. F., figs. 40 ♂, 40*a* ♀).—Hindwing suddenly lengthened at vein 4, thence gradually decreasing to its ordinary length at anal angle. In the wet-season form the *upperside* of male is a rich purple-brown or maroon-brown with a blue gloss. Forewing with discal and postdiscal transverse fasciæ very obscure and only slightly paler than the ground-colour. Hindwing uniform; two triangular, small, black spots near apex of interspace 1, one larger black spot in each of the interspaces 5 and 6; spots bordered outwardly with white slenderly and obscurely. *Underside*: dull maroon-brown. Forewing with a broad, slightly curved discal, narrower postdiscal and subterminal, transverse, pale fascia, the discal one broader anteriorly. Hindwing: a slightly curved, narrow, discal, pale fascia; black spots as on upperside but bordered inwards and outwards by an obscure pale lunular line. Antennæ black with scattered pale specks; head, thorax and abdomen maroon-brown; beneath: all pale-brown. Female *upperside* hazel brown, terminal halves of wings paler. Forewing: discal and postdiscal broad, obscure, pale transverse fasciæ, the former or both sometimes white in the upper part; followed by an obscure, double, subterminal pale line. Hindwing with a series of subterminal, pale, lunular spots, the black

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spots as in the male, the anterior two superposed on the pale spots; terminal margin below vein 4 with double, above vein 4 with single, subterminal line. *Underside*: ground-colour paler on the basal, very much paler on the terminal half; markings as on upperside but fasciæ on fore and hindwings broader, more diffuse. Exp. 41—52 mm.

A variable insect. In the dry season the purple gloss on the upperside of male is hardly present, the fasciæ are more diffuse, the black spots smaller or rarely quite wanting; the underside is paler. In the female the colour is also paler, the contrast between base and outer half of wings more pronounced, the discal fascia on underside very broad, often nearly white: indeed it is often white even on the upperside.

Larva (Pl. I, fig. 12).—The shape of the larva is onisciform, depressed-looking, highest at middle or a little anteriorly to it, broadest at middle, considerably narrowing towards both ends, segment 2 and segment 12 being about the same width; ventrum flat. The larva is distinctly lycœnid in type. Head only semi-hidden, roundish, flattened on face with some few dark, erect hairs; light green in colour. Segment 3 a little wider than, and embracing slightly, segment 2 at the sides; anal segment very convex and narrow (in sense of larval width), rounded at extremity. Segments all well marked and very slightly flanged dorsoventrally. Surface of body covered with tiny, transparent tubercles all over, circular and looking like drops of liquid; segment 2 fringed along margin with long, porrect, light hairs somewhat densely; segments 3 and 4 with a subdorsal and lateral bunch of 4 dark, long, erect hairs; segments 5—12 with a similar subdorsal bunch to segment 3, but with a single hair instead of the lateral bunch; each segment has, besides, a subspiracular line of long, light, straight hairs; anal segment has many white and brown singly disposed hairs. Spiracles are whitish, oval in shape and of ordinary size. Colour of body is light olive-green with the dorsum of each segment, except segment 2, between dark-green, lateral lines reaching the whole length of larva, white; a dark-green dorsal line, along the edges of which the white is suffused with green; a lateral dark green, roundish depression on segments 5—12; the dorsoventral line whitish; ventrum green. L: 18·5 mm.; B: 5 mm.; H: 4 mm.

Pupa. (Pl. I, fig. 12*a*.)—Shape rhomboid, equilateral; a diamond in fact, the breadth at middle, the broadest part, being a little more than ⅓rd the total length. Head square, running out into a flat ledge in front, the contour of which is rounded with a square piece cut out of centre to the depth of the ledge, *i.e.*, there is a point in front of each eye somewhat flattened on top, rounded on outer side and straight on inner side. The anal end is sharply pointed: really minutely truncated at extremity of cremaster. The two lateral angles of the diamond are rounded. Segment 2 and front slope of segment 3 are in the same plane; the latter segment or thorax is somewhat humped, evenly convex from shoulder to shoulder,

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apex slightly the highest part of pupa; the wings are slightly expanded behind shoulders in a semi-cylindrical fold. Constriction is slight dorsally, laterally it is nil. Abdomen dorsally gently convex from thorax to anal end; belly flattish. Spiracle of segment 2 indicated by a small, circular, flush, white space; other spiracles oval, light in colour, on the very dorso-ventral line. Surface of body covered densely with colourless, short-pedicelled, star-topped hairs, the pedicels being longer on the anal segment; a fringe of sparse, long, light hairs round dorso-ventral margin, denser on head and segment 2; ventrum and wings glabrous. Colour of pupa grass green, spotted finely with darker green in squares, a whitish dorsal line, four small black spots on front margin of thorax, the two outer ones the most distinct; a lateral row of distinct black spots and a subdorsal row of obsolescent ones on abdomen; belly whitish. L: 16 mm. B: 6·5 mm. at middle; H: 4·5 mm. at apex of thorax.

Habits.—The egg is laid anywhere on stalks, leaves, &c., of any surrounding small plant, on the food-plant itself, very often on a blade of grass; and nearly always in the evenings in dark, cool places in the hills or heavy jungle country where the imago is found. The larva lives on the underside of the leaves but is found sometimes on the upperside, stalks, &c. It wanders to pupate but not far; consequently the pupa is not often to be found on its own plant and is formed on the underside of a leaf, attached by the tail and a tight body-band and is generally on a bed of white powder. Very often the larva slightly draws the part of the leaf, where it rests together by silks and the pupa may be formed in such a half cell. The imago is a shade-loving butterfly, somewhat lycænid in appearance and in its ways; it, however, never quite closes its wings over its back and has the habit of resting on a leaf at no great height from the ground where it first turns this way, then that, rarely remaining quite quiet, taking a short, rapid, jerky and dodging flight every now and then to return to the same place; it is most active in the late afternoons. It is never seen at flowers. The distribution of this insect is in the Himalayas from Chumba to Kumaon, Nepal and Bhutan, in Umballa, Fyzabad, Malda, Calcutta, Ganjam; in Bombay south of Poona and Bombay; Ceylon, Burma, Tenasserim and China.

(To be continued.)

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ERRATA.

In Part IV of this Paper (No. 1, Vol. XIX.) the following additional *errata* occurred :—

Page 17,	line	11,	for Niceville	.. *read*	..	Nicéville.
„ 23	„	1,	omit comma after..		..	"horny."
„ 23	„	8,	for pensils	.. *read*	..	pencils.
„ 23	„	32	„ *Tarsolepes*	.. *read*	..	*Tarsolepis.*
„ 24	„	32	„ affected	.. *read*	..	affect.
„ 26	„	31	„ twelve month	.. *read*	..	twelve months.
„ 26	„	34	„ seem ..	.. *read*	..	seems.
„ 27	„	15	„ fortnight	.. *read*	..	three weeks.
„ 29	„	16,	omit comma after		..	"those."
„ 36	„	20,	*read* comma instead of full stop after "form."			

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A COLLECTION OF THE OPHIDIA FROM THE CHIN HILLS,

(WITH NOTES ON THE SAME BY MAJOR F. WALL, I.M.S., C.M.Z.S.)

BY

F. E. W. VENNING.

The collection, with the exception of one or two specimens, was made during the latter portion of 1908 and the first few months of 1909 in the neighbourhood of Haka, a small outpost in a remote part of the Chin Hills. This very out-of-the-wayness has its compensations from a naturalist's point of view, for it offers him a rich and practically virgin field for his energies and in the case of the Chin Hills one of special interest in that it is placed between two portions of the Empire which are better known to science but are probably very different in physical characters from the Chin Hills.

The "Imperial Gazetteer of India" describes the Chin Hills as "a "tract of mountainous country inhabited by hill tribes on the N.-W. "border of Burma, lying between 21° 45′ and 24° N, and 93° 20′ "and 94° 5′ E, with an area of about 8,000 square miles. It forms "a parallelogram about 150 miles in length N. and S., and varying "in breadth from 100 to 150 miles.* It is bounded on the North "by Manipur; on the West by portions of the Lushai Hills, and by "the unadministered Chin area that lies to the North and East of "the Northern Arakan District; on the South by unadministered "country and by the Pakokku Chin Hills; and on the East it "borders on the Upper Chindwin and Pakokku Districts. The "tract consists from end to end of a mass of mountains much broken "and contorted and intersected by deep valleys, and is practically "devoid of plains and tablelands. Its main ranges run generally "North and South and vary in height from 5,000 to 9,000 feet."

The whole district forms a portion of the great broken system (? systems) of mountains which divides the Brahmaputra or Assam Valley from that of the Irrawaddy and which reaches its highest points on the Burmese side.

* A curious error as the Chin Hills' Gazetteer, I believe, gives a length of 250 miles and a breadth of 100 to 150 miles *by road*. The area does not much, if at all, exceed 50 miles in breadth "as the crow flies."

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Geologically the chain is believed to belong to the Tertiary epoch and consists chiefly of shales of a soft nature, which easily disintegrate to form a stiff clayey soil, and a fair proportion of sandstones. Limestone is uncommon and igneous rocks are perhaps nowhere found near the surface, at any rate in the Haka Sub-division.

The area consists, then, of a chain of mountains of moderate height situated just within the tropics, and as might be inferred a semitropical vegetation exists, changing into tropical in the deeper valleys where teak, palms, and such trees as the papaya are to be found, and into quite a temperate form on the tops of the higher mountains.

Haka Sub-division is the most Southern of the three Sub-divisions into which the Chin Hills District is divided, and Haka station is situated some 6,500 feet above sea-level on the North-Western slopes of a mountain near the Northern boundary of the Sub-division. The point of the mountain range which is immediately above the station is known as Haka peak and is supposed to be 7,500 feet high. A neck of open grassland, about half a mile to the west of the station, connects the range with another running parallel to the Haka range and of about the same general elevation. This neck throws off its waters from one side into the Boinu river, which after flowing in a gigantic S. reaches the sea at Akyab, and from the other into the Manipur river, a tributary with the Myittha river of the Chindwin. On either side of the station a spur runs down from the peak, and the water collected between the two spurs into a marshy hollow between the Civil station and the Military police lines forms the supply of the community. The face of the hill between the two spurs is clothed with dense jungle, practically impenetrable in the rains but easily entered in most places in the dry weather. This jungle stretches rather more than half way down to the station and provides one of the loveliest views from Haka. At one season it is tinged with the rich hues of autumn, a species of Virginia Creeper contributing largely to the effect, at another it is outlined by the brilliant flowers of *Rhododendron arboreum*. In the cold weather the soft pink of the Cherry *(Prunus puddum)* is shown in exquisite relief against the dark-green of the forest, only to give place to the hardly less vivid contrast afforded

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by the young shoots of the elm. In February the lower edges of the jungle and the entire hillside to far below the station is whitened by the snowy blossoms of the wild pear *(Pyrus pashia)* and a little later the wild rose *(Rosa longicuspis)* begins to produce its spring flowers, and almost throughout the year covers many a bush and tree with its sweet scented sprays.

Below this jungle are a few scattered trees on slopes of coarse grass mingled with gigantic thistles *(Cnicus sp. ? wallichii)* bracken and other herbaceous plants, and the jungle stretches its long fingers down one or two watercourses. Below the grassland a more or less open woodland begins, consisting for the most part of shrubs, small alders, pears, oaks and chestnuts and other similar trees with occasional groves of pine (*Pinus khasia*), and this jungle, broken by patches of short grass having very much the appearance of English commons, spreads down to the valley some 2,000 feet below. The more open nature of this woodland and its stunted character is due, it is believed, to clearance by the Chins at some previous date for their extravagant form of cultivation (Taungya) and to their custom of burning to which reference will be made when dealing with the climate. Below the station is a collection of Chin villages and in the valley a small stream, the Trongvar, flows. The hillside is intersected everywhere by little rivulets, some of which disappear in the dry weather, while in the rains they all become foaming torrents and carve their channels deeper and deeper into the surface the lower they descend. Wherever a suitable hollow occurs a small marsh is formed, and in the cold weather streams and marshes are the haunts of woodcock and two or three species of snipe. The hillsides are generally very steep but a pleasant exception to this rule is the so-called "golf-course" on the neck about half a mile west of the station, where there is open grassland throwing off some delightful undulating downs.

The climate consists of three well-marked seasons. The rains, during which most of the snakes emerge, last from the middle of May to the middle of November, roughly speaking, but this year (1909) the previous Christmas rains having failed a very short hot season was experienced, the rainy season setting in early in April.

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The greater part of the total rainfall is registered during the wet season, a few showers at Christmas and an occasional thunderstorm in March bringing the total to about 90 inches or probably more. It is in the rains that the frogs, toads and lizards on which perhaps the snakes chiefly feed make their appearance, together with leeches, bloodsuckers and a host of small insect life. At the end of the rains a cold season ensues and in January and February and even well into March a thick white frost covers the ground in the mornings. Ice is formed up to a quarter of an inch thick in midwinter, while in December 1908 heavy snow fell on all the higher mountains including Haka peak. The cold weather is followed by a hot dry season during which the atmosphere is rendered almost unendurable owing to the Chin habit of burning not only where they wish to cultivate but wherever there is grass or undergrowth to burn. Like many other Chin customs this is one which, in the opinion of the writer, cannot be too strongly condemned. In a few cases it is done for the purpose of procuring game, which is slaughtered as it flees in terror, but in the majority it is done from pure wantonness, for the Chins keep no cattle for which grazing has to be found. Indeed it is very questionable in the writer's opinion whether the burning, though it makes the green of the new grass more quickly obvious to the eye, does not destroy the more tender and succulent grasses and allow only the coarser kinds to flourish. The question has been well discussed in connection with its effect on teak forests, and there seems to be no doubt that a large amount of the valuable nitrogenous products of the vegetation is lost to the soil by the process. Innumerable young trees are either killed or their growth suddenly checked so that they become stunted and deformed.

After the burning, ferns, thistles and grasses appear and the ground is beautified with the colours of violets *(Viola patrinii)*, Primulas *(Primula denticulata)* and other flowers.

Such are the conditions prevailing where the collection was made, but it is not to be supposed that it is in any way representative even of the Haka Sub-division, still less of the Chin Hills as it was made within very narrow limits. Nearer the plains it is said that the pretty tree-snakes, *Dryophis*, etc., abound, while in the valleys

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King Cobras are reported to be not uncommon. A King Cobra has since been obtained by the writer from near Haka.

As regards the collection itself Major F. Wall, I.M.S., has very kindly examined the writer's notes and some of the specimens as the writer did not feel qualified to offer his opinions without having them corroborated or, if necessary, corrected by some competent authority. Major Wall's remarks will be found incorporated in the text and followed by his initials so as to be easily recognisable, and the writer wishes to express his gratitude to him for his notes which naturally form the more interesting portion of the account, as well as for the instruction and encouragement given by him.

Vernacular names have not been given as the Chins recognise very few snakes and regard them all with horror. The mere display of some specimens in a bottle caused one Chin chief to leave the writer's house precipitately and return to his village. "Rul" (pronounced like the word "rule" but with a tendency not to sound the final "l") is the Chin for a snake in the Haka or Lai dialect. The most usually recognised snake of those collected was the green Pit-viper which was called "rul harr" (harr meaning difficult, sharp, rough). "Rul pi" (pi means big or female) was the name applied to the rat-snake *(Zamenis mucosus)*, while "Sar vut saw," the meaning of which is not obvious, was applied indiscriminately to the snakes *Callophis macclellandi*, *Ablabes porphyraceus*, and *Simotes albocinctus*. "Ngan" is understood by most Chins for the Python or possibly for the Hamadryad, and "Tlua kan" for the Cobra.

Of snake bite no records exist, but a few cases came to the writer's notice. Three military police sepoys were bitten at different times, one in the thumb and two in the toe. In the case of the man bitten in the thumb he immediately put on a ligature and on his return to the lines had the wound cauterized and suffered no ill-effects. Of the other two one put on a ligature of sorts and suffered little, the other did nothing till his leg began to swell when he went to hospital and was treated. He had some fever, twenty-four hours' pain and a leg swollen up to the groin but nothing more. All these three men were bitten by *Lachesis gramineus* or perhaps *jerdoni* as far as could be judged from their descriptions coupled with the

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fact that these species are about the commonest snakes found near here. Two cases were attended to by the American baptist missionary, a medical man. These were Chins who came in on the day after they were bitten in each case. They were treated to no less than five incisions one above the other from the thumb to the shoulder into which permanganate of potash was rubbed! One of these Chins was bitten by a *Lachesis monticola*, identified by the body, the head having been reduced to powder, cooked and applied to the wound by the victim! The other was also bitten by a Pit-viper to judge from the rather vague description given by the missionary.

A few odds and ends were thrown in with the snakes.

FAMILY—TYPHLOPIDÆ.

None represented in the collection but one was found in April 1907 on the road near Taungtek (altitude 4,500 ft.) on the Burma side of the Manipur river. The species was not identified and the specimen could not be preserved for lack of any kind of spirits.

FAMILY—COLUBRIDÆ.

Sub-family—COLUBRINÆ.

Blythia reticulata.

Seven specimens.

No. I.—Length 14 in. Tail 2 in. Ventrals 137. Subcaudals 27 pairs. Postoculars on the right one, on the left two.

No. II.—Length 16¼ in. Tail 1·7 in. Ventrals 141. Subcaudals 21 pairs. Postoculars as in No. I, the lower one on the left very minute.

No. III.—Length 14½ in. Tail 1·85 in. Ventrals 138. Subcaudals 27 pairs, the 9th from the anal orifice being entire. Postoculars on the right two, on the left one.

No. IV.—Length 14 in. Tail 1·9 in. Ventrals 141. Subcaudals 28 pairs. Postoculars two on each side, the lower minute. This specimen appears to have a very minute præocular on either side between the præfrontal shield and the 3rd supralabial.

No. V.—Had to be thrown away, its characteristics were: length 11¾ in. Tail 1·4 in. Ventrals 140. Subcaudals 25 pairs.

No. VI.—Length 13 in. Tail 1·7 in. Ventrals 140. Subcaudals 27 pairs. Postoculars one on each side.

No. 18 of 1909.—Length 18 in. Tail 2½ in. Ventrals 140. Subcaudals 27 pairs.

These specimens were all obtained in Haka on the roads and towards dusk.

No. 3 of 1909.—Length 4⅜ in. Tails ⅜ in. Ventrals 155. Subcaudals 22

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pairs, whitish beneath. This is an immature specimen of some snake which I placed here as I could not decide what else it might be. It was obtained at Fort White (7,500 ft.) in April 1909 by Mr. Angelo, Superintendent of Post Offices, who kindly brought and presented it to me. The anal shield was incorrectly noted by me, *vide* note.

[I examined one of these specimens, *viz.*, the one marked "No. 3 of 1909." It is without doubt a *Blythia reticulata*. The occurrence of this species in the Chin Hills extends its previously known habitat. It has hitherto never been recorded except from the Khasi Hills in Assam. The anal is reported entire, but I find it divided.—F. W.]

Ablabes porphyraceus.

Seven specimens.

	Length.	Tail.	Ventrals.	Subcaudals.	
No. VII.	12½″	2″	215	75	pairs.
No. VIII.	39″	6½″	202	63	,,
No. IX.	23¼″	4¼″	210	74	,,
No. X.	20½″	3½″	214	66	,,
No. XI.	36½″	5½″	210	60	,,
No. XIA.	14¼″	2⅜″	204	65	,,
No. 16 of 1909.	17½″	2¾″	213	66	,,

The dorsal scales counted 19 anteriorly and at midbody, and 17 posteriorly in all the specimens, the reduction being due to the 4th and 5th rows above the ventrals coalescing.

In two specimens Nos. IX and XI the frontal touches eight shields being in contact with the præocular shields in addition to the normal ones.

In No. X the 26th, 27th, and 28th subcaudals counting from the vent are single.

The colour of the small (apparently immature) specimens, Nos. VII, X and XIA was a pale dove-colour (a kind of dirty white), while that of the large ones was a rich red exactly answering to Major Wall's description of "raw beef colour," but this colour rapidly disappears in spirit. No. 16 of 1909 was a yellowish colour, possibly an intermediate stage between the other two. The colour within the annulations was the same in all the specimens, *i.e.*, a deep mahogany red. The number of annulations varied little, but the marks themselves were often very irregular and sometimes were broken up into two or three small circles.

Coluber prasinus.

One specimen, No. XXXVII.

The head only was preserved much bleached by strong spirit, the rest of the specimen had to be thrown away.

Length 42 inches. Dorsal scales 19 anteriorly and at midbody, 15 posteriorly. Ventrals 202. Anal entire. Subcaudals 109 pairs. The hori-

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zontal diameter of the eye slightly less than its distance from the nostril. Frontal shield not as long as its distance from the point of the snout; in contact with eight other shields. Supralabials 9, of which Nos. 4, 5 and 6 enter the orbit of the eye. Præocular one on either side. Loreal one. Postoculars two. Temporals two anterior ones on the right, one on the left. Infralabials 10, five of them touching the anterior and two the posterior sublinguals. The posterior sublinguals longer than the anterior. The specimen came from Nabwel village near Haka, altitude about 5,000 feet.

Coluber tæniurus.

A single specimen, No. 10 of 1909.

Length 5 ft. 6 ins. Tail 12½ ins. The dorsal scales numbered 23—21—17. Ventrals 250. Anal divided. Subcaudals 98 pairs doubtfully. It was caught in the military police lines and apparently taken for a King Cobra to judge from the way it was knocked about.

Simotes albocinctus.

[Var.—*typica*—F. W.]

Two specimens were obtained.

No. XII was killed by my wife about half a mile from Haka on the Haka-Falam road in September 1907, and is now much bleached. Length 20 ins. Tail 4 ins. Dorsal scales 19—19—15. Ventrals 181. Anal entire. Subcaudals 61 pairs. Supralabials on right side seven, of which 3rd and 4th enter the eye; on left eight, 4th and 5th entering the eye.

No. XIII was brought from Nerlon village just below Haka, altitude about 6,000 ft. or perhaps less. Length 29 ins. Tail 4½ in. Dorsals 19—19—15. Ventrals 191, Nos. 75 and 76 from the head having a small division near one side, possibly the result of an accident. Subcaudals 52 pairs. The suture between the internasal shields is greater than that between the præfrontal pair. The supralabials present the same abnormality as in No. XII. Colour mahogany red above, coral red below with large squarish black spots near the ends of the ventrals. There are 27 white dorsal cross bands about two scales wide, edged with black. On the nape the white cross band is distorted forwards to the parietal shields where it disappears, its black margin ending in a circular black spot on the parietals. A black or dark-brown mark curves across the head through the eyes to the labial margin. There are some small black lateral spots.

Oligodon dorsalis.

Four specimens all captured on roads in the station.

	Length.	Tail.	Ventrals.	Subcaudals.
No. XIV.. ..	20″	2¾″	179	35 pairs.
No. XV	16″	1⅞″	170	27 „
No. 9 of 1909 ..	17½″	2¾″	176	42 „
No. 11 of 1909 ..	7″	1″	179	38 „

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The dorsals in all four specimens were 15—15—13, the step occurring at midbody. I have noted under No. XIV the remark "nasal undivided, *i.e.*, nostril pierced in centre of a single nasal shield" and under No. XV "nasal and nostril as in No. XIV." If these remarks are correct the characteristic, though of minor importance, is interesting in view of Major Wall's remarks on the affinities of this species on pages 327 and 328 of Vol. XVIII of the Society's Journal, where the shield is depicted in the illustration as undivided though in the "Fauna of British India" it is described as "divided." A light-coloured vertebral band with a series of black spots (XIV) or a black line (XV) on either side and the bright red colour beneath the tail as described by Major Wall in Vol. XVIII, page 328.

[This species has only once before been recorded from the Burmese Province, *viz.*, from Mansi, Katha District, this specimen being in our Society's collection. Its occurrence in the Chin Hills was to be expected, though never previously reported.—F. W.]

Zamenis mucosus.

One specimen, No. XVI, brought to me from below Nerlon village, altitude about 6,000 ft. or less. Length 6 ft. 6½ ins. Tail 18 ins. Greatest girth 5 ins. Ventrals 192. Anal entire. Subcaudals 92 pairs, the 16th from the tip of the tail being entire.—Dorsals. The disposition of these scales I made out to be as follows:—At two heads-lengths behind head 19, immediately behind this 17, at midbody 17, and at two heads-lengths from vent 10. The steps occurred as below:—

From 17 to 16.—Vertebral and adjacent row on the left unite, after two scales they separate again for one scale's length, then unite, divide again and unite again.

From 16 to 14.—The 2nd and 3rd rows on the left, and the 3rd and 4th rows on the right are absorbed.

From 14 to 13.—The vertebral and adjacent row on the right unite, the scales thus formed being doubly keeled for a considerable distance.

From 13 to 12.—The 2nd and 3rd rows on the left unite.

From 12 to 11.—The 2nd and 3rd rows on the right unite.

From 11 to 10.—The vertebral row unites with the adjoining row on the left and the following scales are again doubly keeled.

The distance "two heads-lengths from the vent" was only roughly taken in this instance. On the right the 7th supralabial is much produced upwards causing a distortion of the temporal shields on that side. There were three loreal shields on the left and four on the right arranged as follows:—anteriorly one large shield followed by three small ones. There was a small subocular, or it might be considered a lower præocular, on either side. The colour is uniform dark-brown.

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Pseudoxenodon macrops.

Two specimens, Nos. 13 and 14 of 1909.

No. 13 of 1909 has a length of 30 ins. of which the tail is 6½ ins. Ventrals 173. Subcaudals 82 pairs.

No. 14 of 1909.—Length 42½ ins. Tail 9 ins. Ventrals 168. Subcaudals 81 pairs.

I should here remark that the identification of these two specimens as well as that of the following ones was worked out by Major Wall. The two *Pseudoxenodon* specimens were originally included by me in my remarks on the *Tropidonoti*, of which I wrote that I found the identification of the species from the literature at my disposal so difficult that I decided to leave it to others; but the return of my manuscript with Major Wall's remarks has enabled me to re-arrange the notes so as to accord with the identification of the specimens and to add the names to the numbers which were given alone before.

Genus *Tropidonotus.*

Two of the specimens I obtained, Nos. XXXV and XXXVI, I thought, at first, must be some new kind, but afterwards thought they might belong to the species *modestus* or the genus *Polyodontophis*. They appeared to me sufficiently interesting to describe at length, but as they have now been given specific rank and are described by Major Wall in a note which will appear in this Journal, it will only be necessary to give a few details here which are not mentioned by him, and to express my appreciation of the honour accorded me.

The two specimens were obtained from close to the station, and I have since obtained a third. No. XXXV was taken on the 8th October 1908 and No. XXXVI on the 26th September 1908.

There is no doubt that these two specimens (XXXV and XXXVI) constitute a species which has hitherto never been described, and I venture to name it after its discoverer. I think there can be no doubt that it should be classified as a *Tropidonotus*, its resemblance to the species of this genus being very striking except in one important particular, *viz.*, the costal rows, which number 17 and remain the same in the whole body length.

Only one other of the Indian *Tropidonoti* has 17 costal rows, *viz.*, *punctlatus* which is also a Burmese snake. In this (*punctlatus*) the rows fall to 15 posteriorly, agreeing with the fall from 19 to 17 which occurs in all other *Tropidonoti*. The subcaudal shields are more numerous in (*venningi*) than in any other Indian species, and in fact than in any other world species excepting two from Madagascar and one from America, still I think it should be considered *Tropidonotus* on the teeth.—F. W.]

The other *Tropidonoti* sent were eleven specimens besides two immature ones. These were supposed all to be either *himalayanus* or *subminiatus*, but

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two of them turned out to be *Pseudoxenodon macrops* and have already been referred to. Major Wall's note, which I place here, gives the identity of the others.

[I have examined the eleven specimens referred to by Mr. Venning and find that his Nos. XVIII, XX, 2 of 1909, and 15 of 1909 are *himalayanus*, his XIX, XXI, 1, 4, and 8 of 1909 are *subminiatus*, and his 13 and 14 of 1909 are *Pseudoxenodon macrops*. The two immature ones referred to marked XL*a* and XL*b*, are *himalayanus*.

Some of the *Tropidonoti* are difficult to identify from one another, and this is specially the case when a specimen is abnormal. It frequently happens that the supralabials and the number of the anterior temporal shields are abnormal, and as these shields are of much assistance in distinguishing between some closely allied species the difficulty will be readily appreciated. No. XIX of Mr. Venning's list from the lepidosis might well be *stolatus*, but the colour negatived the idea. No buff stripes were to be seen, and no black chequering anteriorly, and no supralabials showed black at the sutures. It is in reality *subminiatus*, abnormal in having but one temporal, but the colour of the body did not assist the identification, the usual brilliant vermilion of the neck being totally absent.

The single broad subocular black blotch gave me the clue to its identity, and in comparing it carefully with other *subminiatus* specimens I was able to satisfy myself that it was one of this species.—F. W.]

The following table is reconstructed on the above notes :—

Tropidonotus himalayanus.

No.	Length.	Tail.	Ventrals.	Subcaudals.	Date of capture.
XVIII	.. 26″	$7\frac{1}{2}$″	160	92 pairs	2-7 -08.
XX	.. 27″	$7\frac{3}{4}$″	165	89 ,,	10-10-08.
2 of 1909	.. 25″	$7\frac{1}{4}$″	159	93 ,,	28- 4-09.
15 of 1909	.. $23\frac{3}{4}$″	$2\frac{1}{2}$″	161	24 ,,	Tail imperfect. 9- 7-09.

Tropidonotus subminiatus.

XIX	.. $23\frac{1}{4}$″	$6\frac{1}{2}$″	163	96 pairs	10- 8-08.
XXI	.. $30\frac{1}{4}$″	$8\frac{1}{4}$″	174	91 ,,	14-10-08.
1 of 1909	.. $33\frac{1}{2}$″	8″	167	85 ,,	11- 4-09.
4 of 1909	.. 18″	$4\frac{1}{2}$″	169	94 ,,	9- 5-09.
8 of 1909	.. 39″	$9\frac{1}{4}$″	163	82 ,,	24- 5-09.

No. XVII, which I think must have been a *subminiatus*, had to be thrown away. It was taken on 11th June 1908 and contained about 9 eggs, and it had swallowed a frog. Its length was $29\frac{1}{2}$ inches of which the imperfect tail accounted for 5 inches. It had 8 supralabials with 4th and 5th entering the eye. It had the vermilion tinge on its neck and the single black

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triangular spot on the 6th and 7th labials. Its ventrals were 142, and subcaudals 47. In two cases frogs and in one case the remains of a lizard were found in the abdominal cavity. None of the specimens which were brought to me alive ever showed any temper nor could I induce them to bite. When teased they nearly invariably arched their necks slightly so as to depress their noses to the ground and remained in that position. In no specimen did I note a black nuchal spot although one or two had a distinct orange collar. No. 4 of 1909 has a dark spot in front of the orange collar.

Sub-family—DIPSADINÆ.

Dipsadomorphus hexagonotus.

Two specimens.

No. XXVI.—Length 26 ins. Tail 4¾ ins. Dorsals 19—19—14. The steps take place as follows:—First the 3rd and 4th rows above the ventrals on the left unite making 18 rows, next the 3rd and 4th on both sides unite and the next row to the vertebral on the left is absorbed into the vertebral row making thus 15 rows. After this the vertebral and adjacent rows become very much mixed up and at last at two heads-lengths from the vent 14 rows are left. The ventrals are 242 and the subcaudals 86 (?). The anal is entire.

No. XXVII.—Length 16¾ ins. Tail 3¼ ins. Dorsals 19—19—13, the absorptions occurring in the vertebral rows chiefly. The ventrals are 222 (?).

Psammodynastes pulverulentus.

One small specimen, No. XXVIII, was obtained. Dorsals 17—17—15. Ventrals 161. Anal entire. One anterior temporal. One præocular and two postoculars.

Sub-family ELAPINÆ.

Callophis macclellandi.

Var A.

Four specimens.

No.	Length.	Tail.	Ventrals.	Subcaudals.	Date of capture.
XXII ..	25″	2⅞″	195	33 pairs	10-9-08.
XXIII ..	25¼″	3″	192	34 ,,	15-9-08.
XXIV ..	25″	3″	197	35 ,,	17-9-08.
XXV ..	29¾″	3¼″	194	34 ,,	4-10-08.

No. XXIII had the 4th subcaudals from the vent entire, and No. XXV the 12th from the vent on the left very large and distorted. The black annulations numbered in No. XXII thirty-one, in No. XXIII twenty-nine, the 6th from the head being in two parts, in No. XXIV thirty-one and in No. XXV thirty-two with 4 on the tail in each case. All the specimens had the ivory cross bar on the head. I could never provoke any of them to bite or show any temper.

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FAMILY—VIPERIDÆ.

Sub-family—CROTALINÆ.

Lachesis gramineus.

Two specimens.

No. XXIX.—Length 20 ins. Tail 3½ ins. Dorsals 21—21—15. Ventrals 166. Subcaudals 63. Colour grass green above with a series of white vertebral spots and a white line on the outer rows of scales with a red line below it, extending from the gape to half way along the tail. Tail reddish above. Beneath greenish white.

No. XXX.—Length 25 in. Tail 4 in. Dorsals 21—21—15. Ventrals 159. Subcaudals 55. Colour as in the last but without the vertebral spots. Taken on the 10th October 1908.

Lachesis monticola.

No. XXXI.—Length 19¾ ins. Tail 2¾ ins. Dorsals 25—23—21. Ventrals 151. Subcaudals 36. Three rows of scales between the eye and the labials. Postoculars two small ones. Supralabials 7 on the right, but 8 on the left.

No. XXXII.—Length 21½ ins. Tail 3½ ins. Dorsals 25—25—19. Ventrals 151. Subcaudals 47.

No. 17 of 1909.—An immature specimen, 10¾ ins. in length. Tail 1½ ins. Dorsals 25—23—? Ventrals 144. Subcaudals 40.

Two immature specimens, Nos. XXXI*a* and XXXI*b* were brought in with No. XXXI and said to be its young.

Lachesis jerdoni.

Five mature specimens.

No. XXXIII, a female kept in captivity by me, gave birth on the 12th September 1908 to four young ones two of which, Nos. XXXIII*a* and XXXIII*b* survived. The dorsals counted 21 anteriorly (except in one specimen, No. 6 of 1909 in which they numbered 23), 21 at midbody and 17 posteriorly. Three specimens were captured by me on the rifle range one morning, *viz.*, Nos. 5, 6 and 7 of 1909. No. 5 had subsequently to be thrown away. Nos. 6 and 7 of which 6 is a male and 7, I presume, a female, were caught "in copulâ", I think, as they were found together under a large fallen thistle on 15th May 1909.

A great many of the specimens collected had to be thrown away as will be seen from the following table of the numbers of commoner snakes received :—

Tropidonotus	19 specimens (may include also *Pseudoxenodon*).
Oligodon dorsalis	4 specimens.
Lachesis gramineus	16 specimens.
" *jerdoni*	8 specimens.
" *monticola*	6 specimens.

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It may be remarked that where "lengths" are given they include the tail length which is given under "tail", and that unless otherwise stated such measurements are in inches. In speaking of the number of rows of dorsal scales "anterior" means at two heads-lengths from the head, and "posterior" at two heads-lengths in front of the vent.

In addition to the ophidia, two specimens, out of about one dozen, *Ophisaurus gracilis* were sent. Also an embryo lizard, *Calotes jerdoni* extracted by me from an egg. The remaining eggs of the brood, ten in number, hatched out in a box of earth on 20th August 1908. This is a very common lizard in Haka.

The nomenclature followed is that given by Mr. Boulenger in the "*Fauna of British India, Reptilia and Batrachia*".

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A NEW TROPIDONOTUS FROM THE CHIN HILLS.

BY

MAJOR F. WALL, I.M.S.

TROPIDONOTUS VENNINGI (spec. nov.).

Three specimens were received which from the maxillary dentition I place with the genus *Tropidonotus*. The maxillary teeth are 29, the last two or three gradually enlarging; with no gap separating the enlarged from the preceding teeth. The enlarged teeth are not twice as long as the median teeth. The dentition thus accords with the type of *Nerodia*.

No. 1.—Length 2 feet and 4½ inches, the tail 9 inches.

Rostral touches 6 shields, all the sutures being subequal. *Internasals.*—A pair; the suture between them ¾ that between the præfrontal fellows, ¾ the internaso-præfrontal. *Præfrontals.*—A pair; the suture between them equals the præfronto-frontal; touching the internasal, postnasal, loreal, upper præocular and supraocular. *Frontal.*—The supraocular sutures rather longer than the rest. *Supraoculars.*—Length rather less than frontal, breadth less than half frontal. *Nasals* divided, in contact with the 1st and 2nd supralabials. *Loreal.*—One. *Præoculars.*—Two. *Postoculars.*—Three. *Temporal.*—One. *Supralabials.*—9, the 5th and 6th touching the eye on the left side, 8 with the 4th and 5th touching the eye on the right side. *Infralabials.*—The 7th is the last of the series, and in contact with three scales behind. *Sublinguals.*—Two pairs, the posterior longer than the anterior, and in contact with the 5th, 6th and 7th infralabials. *Costals*, in 19 rows in the whole body length: rather faintly keeled except in the last 3 rows where keels are absent. *Ventrals* 167. *Anal* divided. *Subcaudals* 124 divided except the last four which are entire. *Colour.*—Dark blackish-brown with an indistinct chequering of black streaks. A pale collar incomplete mesially. Head marbled with black and grey, all the labial sutures blackish. Belly black beneath the tail, and hind body, becoming more and more mottled with greyish towards the throat which is mostly a dirty white.

The second specimen agrees except in the following particulars:—The costals are 16 posteriorly owing to a confluence of the 3rd and

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4th rows on the right side. The supralabials are 9 on both sides, the 5th and 6th touching the eye. The ventrals and subcaudals are 172 and 135, the latter all divided. The length is 2 feet 3 inches and the tail 9 inches.

Habitat.—Haka Chin Hills. Type is in the British Museum (Natural History) and co.-type in the Bombay Natural History Society's Collection.

A third specimen has since been obtained in which the ventrals and sub-caudals are 165 + 119.

One juv. sent to the British Museum.

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THE PALMS OF BRITISH INDIA AND CEYLON, INDIGENOUS AND INTRODUCED.

BY

E. BLATTER, S. J.

PART II.

(With Plates II, III, IV & V.)

(Continued from page 64 of this Volume.)

I.—CORYPHINÆ.

Spadix loosely branched, often a prolix panicle. Flowers diclinous, polygamous or hermaphrodite, single or in long rows flowering from above; carpels 3 *(Thrinax 1)*, free or loosely united, always separating after fertilisation and developing into 1—3 smooth berries. Fan or feather leaves; leaflets induplicate.

1. PHŒNICEÆ.

Spadix surrounded by a large complete spathe, remaining closed up to the time of pollination. Flowers diœcious, dimorphic. Ovary of 3 free carpels, one only ripening. Seed ventrally grooved; embryo usually dorsal. Leaves imparipinnate; leaflets with induplicate sides.

DISTRIBUTION.—The whole of Africa (except the palmless regions, the South-African floral region and the East-African islands); Arabia; Western Asia in the region of the Euphrates and Tigris, through India to the Sunda Islands and Cochin-China.

The only genus is:

PHŒNIX, L. GEN. NAT. 1224.

(From the Greek "Phoinix," which was originally the name for "purple colour;" later on the name was given to the Date Palm on account of the colour of the dates, which is somewhat between yellow and purple red.)

Mart. Hist. Nat. Palm. III. 257, 320, t. 120, 124, 136, 164.—Gaertn. Fruct. I. t. 9.—Lam. Ill. t. 893.—Roxb. Corom. Pl. I. t. 74; III. t.

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Hook. Gen. Pl. III, II., 921, 80.—Trim. Journ. of Bot. 1885, XXIII, No. 273, p. 266.

Tall trees or low shrubs, the entire stem or the upper portion only closely covered by the more or less rhomboid bases of the petioles; stems occasionally branched. The first leaf of the seedling, and sometimes the first leaf of root-suckers is lanceolate, entire. Leaves pinnate; leaflets entire, linear, folded longitudinally and attached obliquely with their folded base to the common woody petiole, the lowest pinnæ usually transformed into spines; no midrib, but a slender nerve on either side of the fold; nerves longitudinal, parallel, stout and slender, the slender nerves often obscure; transverse veinlets present, but usually only visible under the microscope in thin sections, cut parallel with the surface of the leaf. In the majority of species the leaflets in the lower portion of the petiole stand in fascicles of 4 or 6, 2 or 3 on each side of the petiole, while the upper leaflets are usually alternate or opposite; common petiole semiterete or flat, often widening at the base into a sheath, which frequently expands into a mass of tough, reticulate fibres. Flowers diœcious, small, yellowish, coriaceous, sessile on the bends of long, glabrous, undulating spikelets, usually supported by 1 or 2 minute, subulate, or triangular bracts, the female flowers often approximate in pairs. The spikelets are inserted in horizontal or oblique lines on both sides of a flat, woody peduncle. Male flowers: Sepals 3, connate in a cupular 3-toothed calyx. Petals 3, obliquely ovate, valvate. Stamens 6; filaments short, subulate; anthers erect, dorsifixed; pistillode minute or absent. Female flowers: Sepals 3, connate in a globose, accrescent calyx. Petals 3, rounded, imbricate, staminodes 6, free or connate in a 6-toothed cup. Carpels 3, free; ovules erect; stigmas sessile, hooked. Peduncle often lengthening after flowering. Fruit a single, oblong, 1-seeded berry, with a terminal stigma, a fleshy pericarp, and a membranous endocarp; seed oblong, ventrally grooved; albumen uniform or subruminate; embryo small.

Species about 12.—Africa, Asia.

273.—Griff. Palms Brit. Ind. 136 t. 128A, 129A, B.—Jacq. Fragm. t. 24.—Kunth Enum. Pl. III. 254.—Miq. Fl. Ind. Bat. III. 62.—T. Anders. Journ. Lin. Soc. XI. 13.—Drude Bot. Zeitg. 1877, 638, t. vi. fig. 27-33.—Benth. &

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Sir Joseph Hooker calls his attempt at diagnosing the Indian species of *Phœnix* tentative and says that it awaits much further knowledge of the living plants before it can be accepted as trustworthy. The same applies to the African species whose classification and distribution is still subject to discussion in spite of the investigations of Schweinfurth, Beccari, Engler, and Drude.[1]

CULTIVATION IN EUROPE.—All the species are stove or greenhouse palms; they are readily raised from imported seeds, sown in sandy soil, in a mild hotbed. When the seedlings have reached a sufficient size, they are potted off singly into small pots with the same kind of soil in which the seeds were sown. Later on, good turfy loam will be better. In the South of France, many of the species are largely grown in the open air, to supply the demand for well grown specimens for the decoration of apartments in Paris and other places. The method adopted is this: "The plants are taken up, the soil shaken from the roots, the palms packed in bundles, and forwarded to Paris, where each one is firmly placed in as small a pot as possible; they are then plunged in a mild hotbed in a warm house which is kept shaded and syringed until new roots have formed, when shading is gradually removed, and the plants hardened off. By these means, much better specimens are more rapidly and cheaply obtained than would be possible under a system of pot-culture from the seedling stage onwards." (Nich. Dict. of Gard.)

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[1] Those who wish to get an insight into the difficulties of the Phœnix-question are referred to the following authors :—

Martius, Historia Naturalis Palmarum, vol. III.

Jacquin, Fragmenta botanica 1809, p. 27.

Kirk, On the Palms of Eastern Tropical Africa, in the Journal of the Linn. Soc., London IX (1865).

Schweinfurth, Im Herzen von Africa.

Beccari, Mitteilungen über die Colonia Eritrea, in "Verhandl. Ges. für Erdkunde" (1892), p. 347.

Engler, Hochgebirgsflora des tropischen Africa in Berliner Akad., Physik. Abt. II. 153.

Beccarri, Malesia, vol. III. 345ff.

Drude, Die Palmenflora des tropischen Africa in Engler's Bot. Jahrb. vol. XXI (1895).

Drude, Palmæ (echte Palmen) in Nat. Pflanzenf. II. 3.

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* Indigenous species.

PHŒNIX SYLVESTRIS, Roxb. Hort. Beng. 73; Fl. Ind. III. 787; Mart. Hist. Nat. Palm. III. 276 (excl. syn. Linn. et Kæmpf.) 326, t. 136. Kunth Enum. III. 255; Wall. Cat. 8602; Griff. in Calc. Journ. Nat. Hist. V. 350; Palms Brit. Ind. 141, t. 228, A; Brandis For. Fl. 554; Ind. Trees 645; Kurz For. Fl. II. 535; Becc. Males. III. 347, 364, t. 43, f. 3; Hook. Fl. Brit. Ind. VI. 425; Cooke, Fl. Bomb. Pres. II. 801.—*Elate sylvestris*, L. Spec. Pl. 1189 (partim).—*Katu Pindel*, Ham. in Trans. Linn. Soc. XV. 86.—Rheede Hort. Mal. III. t. 22, 25.

NAMES.—Wild Date Palm, Date-sugar Palm; Sendhi, Kejur, Khajur, Khaji, Salma, Thalma, Thakil, *(Hind.)*; Kajar, Kejur, *(Beng.)*; Khejuri, *(Uriya)*; Khajur, *(Kol.)*; Khijur, *(Santal)*; Sindi, *(Gond.)*; Khajur, Khaji, *(Panj.)*; Seindi, *(Berar)*; Sendi, Khajura, Khajuri, *(Bomb.)*; Boichand, Sendri, Shindi *(Mar.)*; Kharak, *(Guz.)*; Sandole-ka-nar, *(Dec.)*; Itchumpannay, Periaitcham, Itcham-nar, Itham pannay, *(Tam.)*; Ita, Pedda-ita, Itanara, Ishan-chedi, *(Tel.)*; Ichal, Kullu, Ichalu mara, *(Kan.)*; Khurjjuri, Kharjura, Madhukshir, *(Sans.)*.

DESCRIPTION.—A very graceful palm, when not injured by extracting toddy, 30-50 feet high. Trunk rough from the persistent bases of the leaf-stalks. Crown hemispherical, very large and thick, leaves 10-15 feet long, greyish-green, quite glabrous, pinnate; petioles compressed only towards the apex, at the base bearing a few channelled triangular short spines reaching 4 inches. Pinnules very numerous, densely fascicled, 6-18 by ¾-1 inch long, glaucous, rigid, ensiform, conduplicate at the base, then canaliculate, subulately acuminated, almost spinous pointed, 2-4 farious, some intermediately spreading, others crossing these above and below in an ascending direction. Male flowers white, scented; spadix 2-3 feet long, erect; peduncle highly compressed. Spathes of about the same length, very coriaceous, almost woody, scurfy, separating into two boat-shaped valves. Spikes very numerous towards the apex of the peduncle, especially on its anterior face, generally in fascicles and simple, 4-6 inches long, slender, flexuose. Flowers ¼-⅓ inch long, very numerous, angular, oblique. Calyx cup-shaped, with 3 short rounded teeth. Petals three or four times longer than the sepals, concave, warty on the outside, on the inside

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deeply ridged and furrowed. Filaments scarcely any, or very short, free. Anthers linear, adnate, shorter than the petals. Female flowers: Spadix and spathe much the same as in the male. Spikes arranged in distinct groups, 1-1½ foot long, the lower 4—6 inches not bearing any flowers, flexuose. Flowers distant, roundish. Calyx cup-shaped, obsoletely 3-toothed. Petals 3, very broad, convolutely imbricate, having a small opening at the apex. Staminodes 3-4. Carpels 3, free, erect; ovules solitary; style recurved, inwardly papillose. Fruiting spadix 3 feet long, nodding at the apex from the weight of the fruit, much compressed, of a golden orange colour. Fruit scattered on long pendulous similarly coloured spikes, 1-1¼ inch long, oblong-ellipsoid, orange-yellow, with a terminal stigma, surrounded at the base by the perianth. Pericarp fleshy, yellow, moderate, very astringent, lined by irregular cellular white tissue, part of which adheres to the thin envelope that separates with the Seed. Seeds ⅔ inch long, rounded at the ends, deeply grooved along its whole length on one side, with a slight incomplete furrow on the other side, in the centre of which is a depression with a mammillate fundus, indicating the position of the embryo. Albumen on a transverse section horse-shoe-shaped.

HABITAT.—Tolerably common throughout India, wild or more often cultivated. Forms extensive forests in Rohilkhand, on the low ground along the Ramganga river, and on the plateau of Mysore, between Shimoga and Tumkur, in moister stretches of low ground which intersect and drain the rocky undulating granite hills. Not uncommon in the Siwalik tract and the outer Himalaya, often associated with *Pinus longifolia*, reaching up to 5,000 feet in Kumaon, with stems 40—50 feet high. Ghiaunla in Gharwal at 3,500 feet. Banks of the Bias above Mandi. In the Jamu hills at 2,000 feet elevation. Salt range. Commonly planted and self-sown in most parts of India and Ceylon, except in Sind and South Punjab, where *P. dactylifera* takes its place. Most abundant in Bengal, Behar, on the Coromandel Coast, and in Guzerat. In the Bombay Presidency it is common in moist ground throughout the dry districts, usually along banks and in the beds of streams and watercourses.

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FLOWERS at the beginning of the hot season. Fruit ripens in September and October.

USES.—In many localities, especially in Jessore and other districts of Bengal, this species is of considerable importance, owing to the extensive use of its sap in making sugar. According to Sir George Watt, there were in 1889, 168,262 acres of this palm under cultivation connected with the sugar supply. Sir James Westland has given a full account of the process of tapping the trees and of the manufacture of sugar from the crude sap in his "Report on the District of Jessore, 1874." When the tree is ripe the process of tapping begins, and it is continued each year thereafter. There are in the Date-palm two series or stories as it were, of leaves; the crown leaves, which rise straight out from the top of the trunk, being, so to speak, a continuation of it; and the lateral leaves, which spring out of the side of the top part of the trunk. When the rainy season has completely passed, and there is no more fear of rain, the cultivator cuts off the lateral leaves for one-half of the circumference, and thus leaves bare a surface measuring about 10 or 12 inches each way. This surface is at first a brilliant white, but becomes by exposure quite brown, and puts on the appearance of coarse matting. The surface thus laid bare is not the woody fibre of the tree, but is a bark formed of many thin layers, and it is these layers which thus change their colour and texture.

"After the tree has remained for a few days thus exposed, the tapping is performed by making a cut into this exposed surface, in the shape of a very broad V, about three inches across and a quarter or half inch deep. Then the surface inside the angle of the V is cut down, so that a triangular surface is cut into the tree. From this surface exudation of the sap takes place, and caught by the sides of the V, it runs down to the angle, where a bamboo of the size of a lead pencil is inserted in the tree to catch the dropping sap and carry it out as by a spout.

"The tapping is arranged, throughout the season, by periods of six days each. On the first evening a cut is made as just described, and the juice is allowed to run during the night. The juice so flowing is the strongest and best, and is called jiran juice. In the

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morning the juice collected in a pot hanging beneath the bamboo spout is removed, and the heat of the sun causes the exuding juice to ferment over and shut up the pores in the tree. So in the evening the new cut is made, not nearly so deep as the last, but rather a mere paring, and for the second night the juice is allowed to run. This juice is termed do-kat and is not quite so abundant or so good as the jiran. The third night no new cutting is made, but the exuding surface is merely made quite clean, and the juice which then runs is called jarra. It is still less abundant and less rich than the do-kat, and towards the end of the season, when it is getting hot, it is unfit even for sugar manufacture, the gur (molasses) made from it being sold simply as "droppings." These three nights are the periods of activity in the tree, and after these three it is allowed to remain for three nights at rest, when the same process again begins. Of course, every tree in the same grove does not run in the same cycle, some are at their first, some at their second night, and so on; and thus the owner is always busy.

"Since every sixth day a new cut is made over the previous one, it follows that the tree gets more and more hewed into as the season progresses, and towards the end of the season the exuding surface may be, and often is, as much as four inches below the surface above and below. The cuts are during the whole of one season made about the same place, but in alternate seasons alternate sides of the tree are used for the tapping; and as each season's cutting is thus above the previous season's and on the opposite side, the stem of the tree has a curious zigzag appearance. The age of a tree can of course be at once counted up by enumerating the notches and adding six or seven, the number of years passed before the first year's notch. I have counted more than forty notches on a tree, but one rarely sees them so old as that and when they are forty-six years old they are worth little as produce bearing trees. It is somewhat remarkable that the notches are almost always on the east and west sides of the tree and very rarely on the north and south sides; also, the first notch appears to be made in by far the majority of instances on the east side.

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"As to the produce of one tree, one may expect from a good tree a regular average of five seers per night (excluding the quiescent nights). The colder and clearer the weather, the more copious and rich the produce. In the beginning of November tapping has begun. In December and January the juice flows best, beginning sometimes as early as 3 p.m., and dwindles away as the warm days of March come. If the cultivator begins too early, or carries on too late, he will lose in quality and quantity as much as he will gain by extending the tapping season.

"The next processs is the boiling, and this every rayat does for himself, and usually within the limits of the grove. Without boiling, the juice speedily ferments and becomes useless; but once boiled down into gur, it may be kept for very long periods. The juice which was at first brilliant and limpid, becomes now a dark brown, half-viscid, half-solid mass, and when it is still warm, it is easily poured from the boiling pan into the earthenware pots in which it is ordinarily kept. As it takes from seven to ten seers of juice to produce one seer of gur or molasses, we can calculate the amount of gur which one ordinarily good tree can produce in a season. We may count four and a half months for the tapping season, or about sixty-seven tapping nights. These, at five seers each, produce 335 seers of juice, which will give about forty seers, or one maund of gur, the value of which, at present rates, is from Rs. 2 to Rs. 2-4-0."

After the juice is boiled down into gur it is then sold to the sugar-refiners and by them is manufactured in various ways into different grades of sugar. The best known is called dhulva, a soft moist, powdery sugar, used largely in the manufacture of native sweetmeats. Another kind, termed pucka, is a purer, granular, and more expensive sugar. The waste molasses, collected during the preparation of sugar, is called chitiya gur, when boiled for a longer time, it becomes a black, sticky treacle, which is largely utilised for mixing with the tobacco for the Native hookah, and also for making cheap sweets. A small proportion of the juice is consumed as a drink either fermented or unfermented, under the name of tari, or is converted into vinegar.

Sir George Watt mentions that in recent years an endeavour

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has been made to promote the manufacture of sugar in the Central Provinces; a company has already been formed under the name of the "Khandwa Sugar Manufacturing Company."

From the leaves bags, basket-work, brooms, fans, etc., are made. The footstalks, after being beaten, are converted into ropes for drawing water from wells. The fibres are plentiful, soft, bleach well, and are very well adapted for the use of paper-makers.

From the tree a gum is obtained, of which very little is known. The fruit is of an inferior kind and only eaten by the poorer classes, or used as medicine. Pounded and mixed with almonds, quince seeds, pistachio nuts, spices, and sugar it forms a restorative. A paste formed of the kernels and the root of *Achyranthes aspera*, is eaten with betel leaves as a remedy for ague.

CULTIVATION IN INDIA.—"The soil required for this palm is rich alluvial or black with moving water at about 10 feet from the surface or with irrigation and thorough under-ground drainage from a bed of gravel not less than 6 feet below the surface. The seeds should be sown when quite fresh, without removing the pulp, on a bed of rich loam dressed heavily with leaf-mould. When 6 inches high the little plants should be put out 18 inches apart in carefully prepared nursery beds, and grown carefully till 4 feet high, then transplanted to their permanent quarters, which may be in lines 30 feet apart, with 20 feet between each tree in the line. The ground should then be kept under irrigated crops for two years to get the young trees established." (Woodrow).

ILLUSTRATION.—Plate II. The photograph, supplied by Mr. Phipson, shows a fine specimen of *Phœnix sylvestris* growing on the Hanging Gardens, Malabar Hill, Bombay. The dense, almost spherical crown, with the gracefully bending leaves at once distinguishes this species from the real Date Palm (*P. dactylifera*). The lower part of the stem is covered with ferns and other vegetation. As the stem, however, is the same throughout, *i.e.*, covered by the persistent bases of the leaf-stalks, the imagination can easily supply the hidden part of the trunk.

Plate III. The photograph shows a small group of Wild Date Palms with their natural surroundings. It is a scene on the

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seashore on the East side of Malabar Hill, Bombay, characteristic of many parts of India.

PHŒNIX ZEYLANICA, Trimen in Journ. Bot. XXIII, 267 (1885); Hook. Fl. Brit. Ind. VI. 425; Trimen Fl. Ceylon IV. 326.—*Phœnix zeylanica*, Hort; Hook. f. in Kew Report, 1882, 63.—*Phœnix sylvestris*, Thw. Enum. 329 (non Roxb.).—*Elate sylvestris*, L. Sp. Pl. 1189 (for the most part).—*Phœnix pusilla*, Becc. Malesia, III. 408 (non Gærtn.).

NAME:—Ceylon Date Palm; Indi (in Ceylon).

DESCRIPTION:—Stem 8-20 feet high, rarely much shorter. Leaves rather short; leaflets very many, quadrifariously inserted, subequidistant, 7-10 inches long, linear-lanceolate, pungent, coriaceous, concave, spreading at right angles, bright green. Spathe 8-14 inches long, keel furfuraceous. Spadix 1 foot long or more, young scopiform; peduncle stout; rhachis flattened; branches of male 4-6 inches long, of female longer. Male flowers $\frac{1}{6}$ inch long; stamens 6; anthers subsessile, linear; female spadix long peduncled; peduncle 1 inch broad, flattened, branches 6-10 inches long, divergent in fruit. Female flowers scattered, globose; $\frac{1}{8}$ inch in diameter, calyx cup-shaped; petals orbicular. Fruit $\frac{1}{2}$ inch by $\frac{1}{4}$ inch in diameter, obovoid-oblong, apiculate, red, at length violet-blue; seed nearly as long, with the groove dilating into a canal of various forms.

HABITAT.—Ceylon, moist low country, especially on the Southern Coast, very common.

FLOWERS in February.

USES:—Mats and boxes are made of the leaves. The sweet pulp of the fruit is eaten.

ILLUSTRATION.—Plate IV. The photograph supplied by Mr. Macmillan, shows a specimen of *Phœnix zeylanica*. The leaves are comparatively short and do not exhibit the graceful curves of the Wild Date Palm. The stem is very rough being covered throughout with the bases of the fallen leaves.

PHŒNIX RUPICOLA, T. Anders. in Journ. Linn. Soc. XI. 13, 1869. Becc. Males. III. 348, 395.—*P. Andersoni*, Cat. Hort. Calc. n. 119 (1886—7.); Gard. Chron. 1877, II. 45, fig. 4. Hook f. Flora Brit. Ind, VI. 425.—*Phœnicoidea*, Griff. Journals, 46.

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A FURTHER LIST OF BIRDS OF THE BHAMO DISTRICT, UPPER BURMA.

BY

MAJOR H. H. HARINGTON (92ND PUNJABIS).

(Continued from page 313, Vol. XIX.)

Herewith I send a few additions to my list of Bhamo Birds. Those marked with an asterisk* have been either compared with those in the Natural History Museum, South Kensington, or identified for me.

PARINÆ.

* (31) PARUS ATRICEPS, Horsf.—(Indian grey-Tit.)

Have seen a fine specimen shot by Major Delmè-Radcliffe near Bhamo.

PARADOXORNITHINÆ.

* (52) PARADOXORNIS GUTTATICOLLIS, A. David —(Austin's Crow-tit).

Two nests with parent birds were procured by Major O. K. Tancock, R. A., at Sinlum in April 1909.

CRATEROPODINÆ.

* (62) DRYONASTES RUFICOLLIS (Jard. & S.)—(Rufous-necked Laughing Thrush.)

Very common in the kine-grass jungle round Bhamo; and as it has been recorded from the Upper Chindwin, probably extends right across Northern Burma.

TIMELIINÆ.

* (134) TIMELIA JERDONI, Walden—(Jerdon's Red-capped Babbler.)

Very common in low-lying localities.

* (143) PELLORNEUM MINUS (Hume.)—(Sharpe's Spotted Babbler.)

Common; has a note very similar to *P. subochraceum.*

(165*a*.) *Alcippe Haringtoniæ*, Hartert.

B. B. O. C. No. clv. p. 10.

"*Adult.* Most nearly allied to *A. phayrei*, Blyth, but differs in having a wide black stripe extending backwards from the eyes along the sides of the head and neck, and the outer webs of the primaries darker and less yellow.

It differs from *A. fratercula*, Rippon, in having a much larger and blacker bill, and much brighter outer webs to the primaries, which are yellowish-brown instead of olive-brown.

Culmen 16·5 mm. The wings of two males measure respectively 65 and 66 mm. of a female 69.

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Hab.—Bhamo, Upper Burma.

Type in the Tring Museum : ♂ Bhamo 29, iii. 1909.

Collected by Major H. H. Harington.

Obs.—*A. nepalensis* (Hodgs.) has a white ring round the eye and a smaller and light coloured bill."

* (173 *b*) STACHYRHIDOPSIS BHAMOENSIS, Harington.—(Bhamo Red-headed Babbler.) One specimen procured near Bhamo in the plains.

LIOTRICHINÆ.

(255) MELANOCHLORA SULTANEA (Hodgs.)—(Sultan Bird.)

Recorded by Oates, Fauna, B. I.

BRACHYPODINÆ.

(290) OTOCOMPSA FLAVIVENTRIS (Tick.)—(Black-crested yellow Bulbul.)

Seen on several occasions along the China road.

CERTHIIDÆ.

(356) PNOEPYGA SQUAMATA (Gould).—(Scaly-breasted Wren.)

Recorded by Oates, Fauna, B. I.

SYLVIIDÆ.

* (367) ACROCEPHALUS AGRICOLA (Jerd).—(Paddyfield Reed-Warbler.)

One specimen.

* (379) CISTICOLA TYTLERI, Blyth.—(Yellow-headed Fantail-Warbler.)

One specimen.

* (410) PHYLLOSCOPUS FUSCATUS (Blyth.)—(Dusky Willow-Warbler.)

Very common in the cold weather in low-lying swampy localities. Some of my specimens have narrow white tips to their tail feathers; and Dr. Hartert, who kindly identified my Phylloscopi for me, writes as follows:—"This can only be *P. fuscatus* and the narrow white tips are of "very rare occurrence. I find them in two Chinese specimens, while others "do not show it, and one shows an indication only."

During the cold weather, I only got one specimen of *P. armandii* which is so plentiful at Sinlum during the hot weather.

* (417) P. SUPERCILIOSUS (Gm.)—(Crowned Willow-Warbler.)

* (426) P. LUGUBRIS (Blyth.)—(Dull-green Willow-Warbler.)

* (446) NEORNIS FLAVOLIVACENS, Hodgs.—(Aberrant-Warbler.)

* (446 *a*) N. FLAVOLIVACENS INTRICATUS, Hartert.

Both this bird and the last were procured near Bhamo during the cold weather.

The above were all kindly identified for me by Dr. Hartert.

(448) HORORNIS FORTIPES, Hodgs.—(Strong-footed Bush-Warbler.)

Recorded by Oates, Fauna, B. I.

(468) PRINIA INORNATA, Sykes.—(Indian Wren-Warbler.)?

All my specimens were winter ones, so it was impossible to decide whether they were the above or *blanfordi*.

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LANIIDÆ.

*(488) TEPHRODORNIS PONDICERIANUS, (Gmel.)—(Common Wood-Shrike.)
Probably common round Bhamo.

MUSCICAPIDÆ.

(571) CYORNIS SAPPHIRA, (Tick.)—(Sapphire-headed Flycatcher.)
Recorded by Oates.

* (593) NILTAVA GRANDIS, (Blyth.)—(Large Niltava.)
Nest and parent bird obtained by Major Tancock, R. A., at Sinlum in May 1909.

SAXICOLINÆ.

(611) PRATINCOLA LEUCURA, Blyth.—(White-tailed Bush-Chat.)
Recorded by Colonel Rippon.

RUTICILLINÆ.

*(632) HENICURUS SCHISTACEUS Hodgs.—(Slaty Black-backed Forktail.)
Nest and parent bird procured at Sinlum on 28th April by Major Tancock, R. A.

* (647) CYANECULA SUECICA, (L).—(Red-spotted Bluethroat.)
Three specimens procured.

CINCLINÆ.

* (710) CINCLUS PALLASI, Temm.—(Pallas' Dipper.)
One specimen procured on 10th May 1908, in a stream below Sinlum; at the same time another was seen.
Irish brown, bill horny, legs bluish in front, black behind.

EMBERIZINÆ.

* (791) EMBERIZA PUSILLA, Pall.—(Dwarf Bunting.)
* (798) E. SPODOCEPHALA, Pall.—(Black-faced Bunting.)
Two specimens. I believe this is the first record of this bird from Burma.

MOTACILLIDÆ.

* (828) MOTACILLA OCULARIS, Swinh.—(Streak-eyed Wagtail.)
* (833) M. BOREALIS, Sundev.—(Grey-headed Wagtail.)
* (838) M. CITREOLOIDES, (Hodgs).—(Hodgson's Yellow-headed Wagtail.)
The above Wagtails were identified for me by Dr. Hartert. Of the last, he writes:—"The seven or eight big yellow Wagtails appear to be all "*citreoloides*, as they are rather dark on the upper surface for *citreola*; "but these two are not easy to tell in winter."

DICÆIDÆ.

*(912) DICÆUM CRUENTATUM, (L.).—(Scarlet-backed Flowerpecker.)
Plentiful in the plains.

*(914) D. CHRYSORRHŒUM. Temm.—(Yellow-vented Flowerpecker.)
Procured near Bhamo.

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(916) D. CONCOLOR, Jerd.—(Nilghiri Flowerpecker.)

Entered in my list as recorded by Colonel Rippon, was unfortunately included by mistake; this bird cannot be found in Burma.

* (917) D. OLIVACEUM, Wald.—(Plain-coloured Flowerpecker.)

One specimen.

PITTIDÆ.

* (927) PITTA NEPALENSIS, (Hodgs.)—(Blue-naped Pitta.)

One specimen.

PICIDÆ.

* (975) IYNGIPICUS CANICAPILLUS, (Blyth.)—(Burmese Pigmy Woodpecker).

Dr. Hartert has identified my specimens as belonging to this species, so *I. pygmaeus* should be omitted from my list.

PHŒNICOPHAINÆ.

(1122) RHOPODYTES VIRIDIROSTRIS, (Jerd.)—(Small Green-billed Malkoha.)

Included in my former list as recorded by Colonel Rippon, and was also entered in error.

STRIGES.

Sub-family ASIONINÆ.

1157. ASIO ACCIPITRINUS, (Pall.)—(Short-eared-owl).

Two put up by the regiment during field-firing at Mamauk.

ACCIPITRES.

(1189) PANDION HALIAETUS, (Linn.)—(Osprey.)

A cold weather visitor: a pair were very noisy in March 1909 in a swamp to the south of Bhamo, and, I think, must have bred there, but I found it impossible to get to the spot.

(1191) OTOGYPS CALVUS, (Scop).—(Black Vulture.)

(1196) PSEUDOGYPS BENGALENSIS, (Gm.)—(Indian White-backed Vulture.)

Both seen round Bhamo.

(1232) ELANUS CŒRULEUS, (Desf.)—(Black-winged Kite.)

One seen near Halone on 8th January 1909.

*(1237) CIRCUS ÆRUGINOSUS, (Linn.)—(Marsh Harrier.)

One specimen.

*(1243*a*.) ASTUR PLUMBARIUS KHAMENSIS, (Bianchi.)—(Bianchi's Goshawk.)

I shot a very fine specimen of the above on our range at Bhamo, it was identified by Dr. Hartert, who writes:—"I find the Goshawk is the "Tibetan race..... From Kham, S. E. Tibet. Described in the B. B. O. "C., XVI, p. 71, March 1906."

*(1247) ACCIPITER NISUS, (Linn.)—(Sparrow Hawk.)

I got two sparrow-hawks: one described in my last list as *melanoschistus*: and a fine female on 29th January 1909. Dr. Hartert continues:—".....

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The Sparrow Hawk (male) you now send is a very typical male of *A. nisus* "*melanoschistus*, while the female does not belong to this dark form, but is "rather a pale *nisus*." The former is probably a resident as it was procured in April, the latter a winter visitor from China.

(1265) TINNUNCULUS ALAUDARIUS, (Gmel).—(Kestrel.)

Seen on several occasions.

GALLINÆ.

PHASIANIDÆ.

*(1327) POLYPLECTRUM CHINQUIS (Müll).—(Grey Peacock-Pheasant).

Had a fine specimen brought in alive by a Kachin just before the Regiment left Bhamo; since sent to the Rangoon Zoological Garden.

(1340) GENNÆUS ANDERSONI (Elliott).—(Anderson's Silver Pheasant.)

Specimen got by Col. Rippon from Warar Bum, Military Police Post, 6,000 ft., and E. of Bhamo. (E. W. Oates. The Ibis, Jan. 1903.)

(1340) G. RIPPONI, Sharpe—(Rippon's Silver Pheasant.)

Specimen by Major Nisbett from Pansibum, 7,000 ft., and E. of Bhamo. Also been procured in Yunnan and at Keng Tung. (E. W. Oates. The Ibis, Jan. 1903.)

*(1340) GENNÆUS HARINGTONII, Oates.

Ann. and Mag. of Nat. History Ser. 8, Vol. V, February 1910.

Male and female shot by me at Nilum Kha, S. E. Bhamo, in March 1908.

(1340) G. DAVISONI. (Grant)—(Davison's Silver Pheasant.)

N. E. of Bhamo. Exact locality not known. (E. W. Oates. The Ibis, Jan. 1903.)

*(1340) G. BATEMANI, Oates—(Bateman's Silver Pheasant.)

Takes the place of *horsfieldi* in Burma. I procured three specimens at Sinkin. (E. W. Oates. B. N. H. S. J.) Vol. XVII, p. 10).

(1354) EXCALFACTORIA CHINENSIS. (Linn.)—(Blue-breasted Quail.)

Several shot at Lweje in December last: they must be very late breeders as many half-grown birds were put up.

(1355*a*.) COTURNIX JAPONICA. (Temm.)—(The Japanese Grey Quail.)

We shot half a dozen during a short trip to Lweje in December last.

HEMIPODII.

* (1382) TURNIX PUGNAX (Temm.)—(Bustard-Quail).

Common round Bhamo.

* (1386) T. BLANFORDI, Blyth—(Burmese Button-Quail.)

Procured at Lweje.

RALLIDÆ.

(1399) AMAURORNIS BICOLOR (Wald.).—(Elwes' Crake.)

On 9th May 1909, Major Tancock, R.A., procured a nest with six eggs and parent bird at Lweje. I compared the latter with those in the N. H. Museum (S. K.) and found it typical. This, I believe, is the first record of

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A. bicolor from Burma. On 29th May 1905, my spaniel put up a Bamboo Partridge out of a small swamp, and as it was so noisy, I thought there must be a nest, so I told a Kachin to look carefully, pointing out the exact spot, the bird having got up within a few feet of me. Sure enough, the Kachin found a nest at the very spot and, to my surprise, brought out a nest of four unmistakeable Rails' eggs. I had the swamp well hunted, but could put no other bird out. Whether the Bamboo Partridge had annexed the nest or not I cannot say, but it was very strange finding a nest at the exact spot. These four eggs agree both with Major Tancock's and with some which I have received from India.

(1402) GALLINULA CHLOROPUS (Linn.)—(Moorhen.)

(1403) GALLICREX CINEREA (Gm.)—(Watercock.)

(1404) PORPHYRIO POLIOCEPHALUS (Lath.)—(Purple Moorhen.)

(1405) FULICA ATRA, Linn.—(Coot.)

All the above seen when out duck-shooting.

LIMICOLÆ.

(1418) ŒDICNEMUS SCOLOPAX (S. G. Gmel.)—(Stone-Curlew.)

Several heard at night in the fields near Helon.

* (1427) GLAREOLA LACTEA, Temm.—(Small Indian Swallow-Plover.)

* (1436) VANELLUS VULGARIS, Bechst.—(Peewit.)

A pair was shot by Major W. G. Nisbett near the Fort, Bhamo. I have recorded this bird before from Thamanthi, Upper Chindwin.

(1451) HIMANTOPUS CANDIDUS, Bonn.—(Black-winged Stilt.)

* (1465) TOTANUS FUSCUS, Linn.—(Spotted Redshank.)

* (1474) TRINGA TEMMINCKI, Leisler.—(Temminck's Stint.)

* (1482) SCOLOPAX RUSTICULA, Linn.—(The Woodcock.)

Fairly plentiful during the cold weather round Bhamo.

(1486) GALLINAGO SOLITARIA, Hodgs.—(Himalayan Solitary Snipe.)

On the 9th December last, when on the march between Sinlum and Lweje, Bhamo District, I shot a fine specimen of the above, as recorded by me in the *Rangoon Gazette* of the 27th December 1909.

* (1487) GALLINAGO GALLINULA (Linn.)—(The Jack-snipe.)

One or two shot every season.

CICONIÆ.

(5159) HERODIAS ALBA (Linn.)—(Large Egret.)

(1568) NYCTICORAX GRISEUS (Linn.)—(Night Heron.)

* (1574) BOTAURUS STELLARIS (Linn.)—(Bittern.)

I shot one in the swamp at the bottom of the polo ground.

ANSERES.

CYGNUS (?)

On 8th December 1908 while two of us were out snipe-shooting in the swamp to the South of the polo ground, we were completely taken by sur-

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prise on putting up an unmistakeable swan. It was again seen by a visitor a few days later, who asked who kept swans at Bhamo as he had seen one alight on the river. After this it seems to have disappeared. The bill seemed particularly small and black in colour.

(1595) CHAULELASMUS STREPERUS (Linn.)—(Gadwall.)

(1606) NYROCA FERRUGINEA (Gm.)—(White-eyed Duck.)

(1609) N. FULIGULA (Linn.)—(Tufted Duck.)

The above were all procured during the last shooting season.

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A LIST OF THE BUTTERFLIES OF THE PALNI HILLS WITH THE DESCRIPTIONS OF TWO NEW SPECIES.

BY

CAPT. W. H. EVANS, R. E.

WITH A NOTE ON MIGRATION BY MR. J. EVERSHED.

The Palni Hills may roughly be described as situated between the Nilgiris and Travancore and though excellent butterfly lists from the latter districts have been published, no such information, as far as I know, has ever been compiled for the Palnis.

I do not propose to give a long description of the district nor am I qualified to do so: intending visitors should obtain a "Guide to Kodaikanal" from Combridge. Under present arrangements the visitor to the Palnis leaves the S. I. R. at Kodaikanal Road station, proceeds for 33 miles by motor bus or bullock cart to the "Tope" bungalow at the foot of the hills (1,500 feet), and is then carried or rides up the Ghat road for another 12 miles to Kodaikanal (7,000 feet).

In Kodaikanal itself the blue gum and wattle has run riot and ousted most of the indigenous jungle with the result that butterfly life is not so prolific as it might be; a few good butterflies may, however, be picked up on the Downs and in Bombay Sholah. Most of the neighbouring valleys below the station contain "Sholahs" or patches of indigenous jungle in which butterflies may be obtained; the best of these is Tiger Sholah, situated at 5,000 feet, with Perumal and Neutral Saddle beyond. It is, however, in the jungles at the foot of the hills that butterflies really abound: the first 6 miles up from the Tope forms an excellent hunting ground, while the best place of all is the vicinity of the third mile-stone (2,000) where a small stream crosses the road.

My own experience was gained during a visit to Kodaikanal from the end of August to the beginning of October 1909. Mr. J. Evershed, of the Observatory, has sent me several useful notes as well as a note on migration, which I venture to think will prove of unusual interest. Dr. T. H. Campbell has given me the benefit of his experience gained during the months of May and June; he has also been through a collection belonging to Dr. Tracy. Dr. Henderson, of the Madras Museum, kindly let me go through the

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Museum collection and showed me several butterflies he had caught himself during a recent visit to Kodaikanal. My thanks are also due to Father Gonpére of St. Xaviers College, Shembaganur, who kindly let me go through the College collection; I understood from him that periodically the better insects are removed to the College at Trichinopoly, which unfortunately I was unable to visit.

The list is, I am afraid, rather meagre; there are a number of common species not included, which are bound to occur and I think that an ardent resident collector would not take long to add another hundred species.

1. *Hestia malabarica.*—Dr. Campbell saw some specimens several years ago in the St. Xaviers College collection which he thinks must have come from somewhere in the Palnis.

2. *Danais plexippus.*
3. *Danais chrysippus.*
4. *Danais septentrionis.*

} Common all the year at low elevations and often seen high up, especially during migrations in October and November.

5. *Danais limniace.*—Obtained by Mr. Evershed at 2,000 feet in June, also caught by Dr. Henderson.

6. *Danais aglea.*—Rare at low elevations, May, June, October.

7. *Danais nilgiriensis.*—Common above 2,000 feet all the year round, especially so in Tiger Sholah.

8. *Euploea coreta.*
9. *Euploea core.*
10. *Euploea kollari.*

} All fly together at low elevations probably throughout the year; the species are difficult to differentiate between on the wing. I spent a morning near the Tope catching nothing but Euploeas which happened just then to be particularly abundant, and found that 80 per cent. proved to be *core*, 16 per cent. *coreta* and 4 per cent. *kollari*. *Core* is frequently seen at high elevations especially during migrations, while *coreta* may be caught in Tiger Sholah.

11. *Mycalesis perseus.*—Dr. Tracy has a pair from 3,000 feet.

12. *Mycalesis mineus.*—Two wet season males caught near the Tope in September.

13. *Mycalesis subdita.*—Wet season form common to 6,000 feet, May, June, August to October; the dry season form recorded by Mr. Evershed in November. My specimens differ from wet season *visala* from Sikkim precisely as described by Bingham with respect to the male brand, while all the ocelli on the underside are smaller and less prominent. The brand in dry season *visala* from Sikkim does not seem to pierce the discal band as it should do.

14. *Mycalesis oculus.*—Very common above 4,000 feet in forest, May, June, August to October, especially in Tiger Sholah. Dr. Campbell notes that a fresh brood appears at the end of May.

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15. *Mycalesis malsara lepcha.*—Common all the year round up to 6,000 feet; dry season form in February.

16. *Mycalesis junonia.*—Uncommon near the Tope in May, June and September.

17. *Orsotriæna meda mandata.*—Caught by Drs. Campbell and Tracy at the third mile-stone in July.

18. *Lethe drypetis.* } Common at all elevations in May, June
19. *Lethe rohria nilgiriensis.* } August to October, especially in Tiger Sholah.

20. *Ypthima baldus.*—Very common to 6,000 feet, April to June, August to October; I found both seasonal forms flying together in the Autumn.

21. *Ypthima chenui.*—I found this rare between 2,000 and 5,000 feet in August and September; Dr. Campbell found it common at these elevations in May and June near Neutral Saddle and on the road to the Tope.

22. *Ypthima ypthimoides.*—Extremely common above 5,000 feet more or less all the year round.

23. *Ypthima huebneri.* } Common to 4,000 feet in May, June,
24. *Ypthima huebneri ceylonica.* } August to October. I do not understand why Bingham in this and many other instances, notably the Symphædras, calls one butterfly a race of another when both fly together; would it not be simpler to consider *ceylonica* as a distinct species or as a dimorph of *huebneri* until breeding experiments settle the point.

25. *Melanitis ismene.*—I only secured one wet season specimen near the Tope in September; Dr. Campbell records it as common in Tiger Sholah and Kodaikanal in May and June; Mr. Evershed finds it common at high elevations in December, January.

26. *Melanitis bela varaha.*—Dr. Tracy obtained one in July.

27. *Elymnias caudata.*—Rare at 3,000 feet, May, September.

28. *Discophora lepida.*—One male at the third mile-stone in September.

29. *Charaxes psaphon imna.*—A male in the St. Xavier College collection.

30. *Charaxes fabius.*—Dr. Campbell obtained two specimens at the third mile-stone in May and June.

31. *Eulepis athamas.*—Common at low elevations, April to June, August to October.

32. *Apatura parisatis camiba.*—Common above 3,000 feet; May, June, August and September; females are less often met with than males as they frequent bushes not paths as the male does.

33. *Euripus consimilis.*—Dr. Campbell has found this insect not uncommon at the third mile-stone in May and June.

34. *Euthalia lepidea.*—Seen by Mr. Evershed near the Observatory.

35. *Euthalia garuda.*—One female in the St. Xavier College collection and a male caught by Dr. Tracy near Perumal in July.

36. *Euthalia nais.*—Common at low elevations; May, June, August and September.

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37. *Moduza procris.*—Taken by Mr. Evershed in April and recorded by Dr. Campbell from Tiger Sholah.

38. *Pantoporia ranga.*—Rare, about 2,500 feet; August, September.

39. *Athyma perius.*—Common at 2,000 to 6,000 feet: in May, June, August to October.

40. *Neptis eurynome.*—Common at all elevations; April to June, August to October. Two forms occur, one with the underside golden and the other chocolate; in the latter the veins of the forewing are very heavily marked with black, a feature I have not observed in specimens from North India.

41. *Neptis columella.*—Rare at low elevations in September, and obtained by Dr. Henderson in May; my specimens are blue tinted as *jumbah.*

42. *Neptis jumbah.*—Common at low elevations; May, June and September.

43. *Neptis soma kallaura.*—Rather uncommon in Tiger Sholah; May, June and September. The *soma* group is very puzzling; my specimens differ a good deal from Bingham's description, they are larger with the markings more or less sullied and the underside deep chocolate; I have a specimen of *hampsoni* from the Nilgiris and a long series of *soma* from Sikkim and find that *kallaura* is a very distinct form.

44. *Rahinda hordonia.*—Common at a low elevations and occasionally seen in Tiger Sholah; in May, June, August to October. I have failed to find the differences pointed out by Mr. Bell, as regards the light and dark male mark, in either Sikkim or Palni Hill specimens.

45. *Cyrestis thyodamas.*—Not common at low elevations and sometimes seen at 7,500 feet; in May, June, September, October.

46. *Junonia iphita.*—Very common to 5,000 feet; May, June, August to October, and has been seen at 7,500 feet.

47. *Junonia lemonias.*—Found with *iphita*; Mr. Evershed records it as especially common in December and January.

48. *Junonia orithyia.* } Common at all elevations and seasons especially
49. *Junonia hierta.* } *hierta.*

50. *Junonia almana.*—Recorded as occurring rarely at all elevations. I did not come across it.

51. *Vanessa cardui.*—Common always and everywhere.

52. *Vanessa indica.*—Common above 3,000 feet; April to June, August to October. Mr. Evershed notes that the larva has precisely the same habits as the larva of *V. atalanta* and feeds on the leaves of stinging nettles, which it spins together.

53. *Vanessa canace.*—Common at 4,000 to 6,000 feet; May, June, August to October.

54. *Hypolimnas bolina.* } Common at low elevations; May, June, August to October and occasionally seen at high elevations especially during migrations.
55. *Hypolimnas misippus.* }

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56. *Kallima horsfieldi.*—Always to be seen near the third mile-stone in May, June, August to October: difficult to catch as it always perches on branches just out of reach.

57. *Cynthia asela saloma.*—Males in the St. Xavier College collection.

58. *Atella phalantha.*—Common everywhere probably all the year round.

59. *Cupha placida.*—Rare below 4,000 feet: September. Dr. Campbell found it common in Tiger Sholah and to 7,000 feet in May and June. Mr. Evershed records it from Tiger Sholah in October and has seen it in the Observatory compound, 7,500 feet.

60. *Argynnis hyperbius castetsi.*—Common all the year round at high elevations. Mr. Evershed notes that the larva is black with red spines and feeds on the long leaved violet; as one violet is not enough for one caterpillar and the plants are few and far between, the larva may frequently be observed wandering over the Downs in search of its foodplant.

61. *Cirrochroa thais.*—Not rare near the Tope in May and September.

62. *Byblia ilithyia.*—Obtained by Dr. Tracy at Periyakulam, in the plains five miles from the Tope.

63. *Ergolis ariadne.*—Common at low elevations; May, June, August to October; seen at high elevations during migrations.

64. *Ergolis merione taprobana.*—Common to 6,000 feet: May, June, August to October.

65. *Telchinia violæ.*—Rare, 5,000 to 7,000 feet; May, June.

66. *Libythea celtis lepitoides.*—One near the Tope; September.

67. *Libythea myrrha.*—Common to 5,000 feet: April to June, August to October; a few observed at 7,000 feet.

68. *Abisara echerius.*—Common to 6,000 feet: May, June, August to October; a fresh brood appears early in June.

69. *Papilio minos.*—Common to 7,000 feet; January, May, June, August to October: it sails along at a great height from the ground and is difficult to catch.

70. *Papilio hector.*
71. *Papilio aristolochiæ.*
} Common at low elevations; May, June, August to October. *Hector* is often seen at the highest elevations.

72. *Papilio demoleus.*—Common everywhere and always.

73. *Papilio helenus daksha.*—Common above 2,000 feet; May, June, August to October. Mr. Evershed has observed the larva on Orange and Pomolo bushes.

74. *Papilio polytes.*—Common at low and often seen at high elevations probably all the year.

75. *Papilio polymnestor.*—Common to 5,000 feet and often seen higher still in May, June, August to October.

76. *Papilio crino.*—Not uncommon at low elevations: June, September and October.

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77. *Papilio eurypylus jason.*—Common at low elevations in September and October.

78. *Papilio agamemnon.*—I saw one near the Tope in September. Dr. Campbell records it as fairly common to 7,000 feet in May and June; seen migrating by Mr. Evershed in November.

79. *Papilio sarpedon teredon.*—Common everywhere: April to June and August to October.

80. *Leptosia xiphia.*—Not rare at low elevations; May, June, August to October; seen by Mr. Evershed at the Observatory.

81. *Delias eucharis.*—Common to 5,000 feet: January, May, June, September; sometimes seen at high elevations.

82. *Anaphæis mesentina.*—Rather rare at low elevations; May, June and September.

83. *Pieris canidia.*—Common above 5,000 feet: April to June, August to October.

84. *Huphina nerissa phryne.*—Common at low and rare at high elevations: April to June and August to October.

85. *Ixias pyrene.* } Common at low elevations: April to June and
86. *Ixias marianne.* } August to October.

87. *Appias libythea.*—Males uncommon, females rare at low elevations in September and October.

88. *Appias albina.*—Not uncommon at low elevations: May, June, August to October. Mr. Evershed caught a pair migrating.

89. *Appias indra narendra.* Rare in Tiger Sholah; May, June.

90. *Catopsilia crocale.* }
91. *Catopsilia pyranthe.* } The first two common, the third rare, at all elevations probably throughout the year.
92. *Catopsilia florella.* }

93. *Colias hyale nilgiriensis.*—Common on the Downs at 7,000 feet all the year. Mr. Evershed has found the larva feeding on *Parochetus communis.*

94. *Terias libythea.* }
95. *Terias venata.* } Common at all elevations all through the year.
96. *Terias hecabe.* }

97. *Terias læta.*—Not caught by me; recorded as common all the year in the neighbourhood of Neutral Saddle.

98. *Terias silhetana.*—Fairly common at low elevations in August and September.

99. *Colotis amata.*—I did not see this. Dr. Campbell records it as common at low elevations in May and June and obtained a male at Neutral Saddle.

100. *Colotis fausta tripuncta.*—Male common, females rare in May, June, August to October. Dr. Campbell obtained a male at Neutral Saddle.

101. *Colotis etrida.*—Uncommon to 7,000 feet; May, June, August to October.

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102. *Colotis eucharis.* } Common at low elevations: April to June,
103. *Colotis danæ.* } August to October.

104. *Hebomoia glaucippe.*—Common at low elevations and occasionally seen at high elevations; January, May, June, August to October; females are rare. My specimens resemble Sikkim specimens exactly.

105. *Pareronia hippia.*—Fairly common at low elevations in September and October.

106. *Pareronia ceylanica.*—Rare at low elevations: June, August and September.

107. *Megisba malaya* (tailed). } Rare at low elevations in September.
108. *Spalgis epius.* }

109. *Cyaniris puspa.*—Common to 6,000 feet; August, September.

110. *Cyaniris lilacea.*—Three males at 2,000 feet in September. I differentiate it from *puspa* by the complete absence of white above and by the smaller, more sharply defined markings on the underside.

111. *Cyaniris albidisca.*—Common, April to June, August to October, above 5,000 feet especially in Bombay Sholah.

112. *Cyaniris akasa.*—Occurs with *albidisca* but is met with in more open country and extends lower down.

113. *Cyaniris huegeli singalensis.*—A few males obtained with *lilacea.*

114. *Cyaniris limbata.*—One male at 2,000 feet in September: only to be distinguished from the preceding by its darker colour.

115. *Chilades laius.*—Common at low elevations; May, June, August to October.

116. *Zizera maha.* } Common at all elevations probably throughout
117. *Zizera gaika.* } the year.
118. *Zizera otis.* }

119. *Zizera lysimon.*—Not observed by me; recorded by Dr. Campbell as not rare on the Tope road in May and June.

120. *Azanus ubaldus.*—One male near the Tope in September.

121. *Azanus jesous.*—Common at low elevations; May, June, August to October.

122. *Lycænesthes lycænina.* } Common to 5,000 feet; May, June, Sep-
123. *Everes argiades.* } tember and October.

124. *Talicada nyseus.*—Common at high and rare at low elevations in January, March to June, August to October. Dr. Campbell has found the pupæ in March on Stonecrop.

125. *Nacaduba macrophthalma.*—Rare to 6,000 feet, September; common to 3,000 feet, May and June. I obtained a male at 2,000 feet in September which I identify very doubtfully as this species; it is the size of *ardates*, the ground colour above is quite unlike *macrophthalma* being shining purple with broadish borders rather as in *Lycænesthes emolus* from Sikkim and exactly as in a specimen of *N. hampsonii* I have from Pachmarhi. On the underside it resembles *N. cœlestis* with the ground colour much darker and of

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course lacking the basal fascia; the discal fascia is displaced outwards between veins 4 and 5, a feature I have never noticed in *macropthalma*. There is an exactly similar specimen in the Society's Museum from the Palnis.

126. *Nacaduba ardates.*—Common at all elevations, April to June, August to October; the tailed and tailless forms occur together. Here as in Sikkim the tailed form is much lighter below with all the fasciæ straighter, narrower and more regular. It is a pity that no one has yet been able to prove by breeding that the two forms are identical; the tailed form has been bred in N. Kanara but unfortunately the tailless form does not appear to occur there.

127. *Nacaduba atrata.*—Common to 6,000 feet, August to October, but not recorded by Dr. Campbell. My specimens can easily be separated into two groups, viz., *atrata* and *prominens*; in the *atrata* group the fifth striga from the base is even and continuous while in the *prominens* group it is always broken at vein 2.

128. *Nacaduba kodi*, n. sp.—Two males and a female in poor condition, at 2,000 feet in September. Ground colour above and below as *N. dana* but rather darker, hindwing tailed, basal strigæ not to vein 1, discal strigæ to vein 1. As regards the markings below it is closely allied to *N. ancyra* and *hampsonii*; it differs from the former in the shape of the wings and from the latter in the shade of blue above as well as in having no tail. The female, a very poor specimen, has no blue above at all; below it is much lighter than the male.

129. *Lampides bochus.*—Dr. Campbell records this as rare in May and June; Mr. Evershed has caught it at 7,000 feet.

130. *Lampides celeno.*—Common everywhere, January, May, June, August to October.

131. *Lampides elpis.*—Rare at low elevations, May, June and September.

132. *Catochrysops strabo.*—Common at low elevations, May, June, August, September.

133. *Catochrysops cnejus.*—Common everywhere, August, September.

134. *Catochrysops pandava.*—In the Society's Museum from the Palnis.

135. *Tarucus plinius.*—At low elevations common in May, rare in September.

136. *Castalius ananda.*
137. *Castalius rosimon.*
138. *Castalius ethion.*
139. *Castalius decidia.*

More or less common to 5,000 feet, May, June, September, October. *Rosimon* has been caught in the Observatory compound.

140. *Polyommatus bœticus.*—Common everywhere and always.

141. *Curetis thetis.*—Rather rare to 2,000 feet, May, June, September and October.

142. *Amblypodia anita.*—Males common, females not seen, to 2,000 feet, June and September.

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143. *Surendra quercetorum.*—Fairly common at low elevations, June, August to October.

144. *Aphnæus vulcanus.*—Rare at low elevations, September; Dr. Campbell caught a male at Neutral Saddle in June.

145. *Alphnæus lohita.*—Seen at the Tope in September; Dr. Tracy has a female from Neutral Saddle in June and Mr. Evershed a specimen from Perumal.

146. *Hypolycæna nilgirica.*—A female of this rare species in the St. Xavier College collection.

147. *Camena cleobis.*—A female at 4,000 feet in September.

148. *Catapœcilma elegans.*—Not uncommon in Tiger Sholah and at Perumal in May and June.

149. *Rathinda amor.*—Rare to 2,000 feet, September.

150. *Loxura atymnus.*—Common at low elevations, May, June, August to October.

151. *Rapala varuna.*—A female in the St. Xavier College collection.

152. *Virachola perse.*—Several specimens in the St. Xavier College collection.

153. *Celænorrhinus ambareesa.*—Common at low elevation, May, June, August and September; Mr. Evershed has caught it at 6,000 feet.

154. *Celænorrhinus leucocera.*—Common to 3,000 feet and a few caught in Tiger Sholah, May, June, August to October.

155. *Celænorrhinus spilothyrus.*—Common in Tiger Sholah in September.

156. *Coladenia tissa.* } Occur more or less commonly to 3,000 feet,
157. *Coladenia dan.* } May, June, August to October.

158. *Tagiades obscurus.*—Rare at low elevations; May, June and September.

159. *Tagiades atticus.*—Seen near the Tope in September; one specimen in the St. Xavier College collection.

160. *Odontopltium sura.* } Common at low elevations, May, June,
161. *Caprona ransonnettii.* } August to October.

162. *Caprona syricthus.*—Two near the Tope in September.

163. *Hesperia galba.*—Common at all elevations, May, June, August and September.

164. *Gomalia albofasciata.*—Not common at low elevations, in September.

165. *Baracus subditus.*—Common between 4,000 and 6,000 feet, especially so in Tiger Sholah, in May, June and September.

166. *Taractrocera ceramas.*—Fairly common at high elevations on the Downs in August and September.

167. *Iambrix salsala.*—Common at low elevations, May, June, August to October.

168. *Ampittia maro.*—Caught by Dr. Henderson and also in the Society's Museum from the Palnis.

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169. *Aeromachus dubius.*—Fairly common above 5,000 feet in May, June, August to October.

170. *Hyarotis adrastus.*—Seen at 2,000 feet in September.

171. *Arnetta vindhiana.*—Rare from 2,000 to 5,000 feet in September.

172. *Notocrypta restricta.*—Rare in Tiger Sholah, May, June.

173. *Udaspes folus.*—Seen near the Lake in September.

174. *Cupitha purreea.*—One male near the Tope, September.

175. *Telicota bambusæ.*—Rare at low elevations, September.

176. *Telicota concinna.*—Rare in Tiger Sholah, September.

177. *Telicota gola.*—Two at 2,000 feet, September.

178. *Telicota dara.*—Fairly common to 6,000 feet, August to October. Very variable as usual. I follow Elwes and Edwards in considering *mæsa, mæsoides, pseudomæsa,* etc., as synonyms of *dara.*

179. *Halpe ceylonica.*—Two specimens at 2,000 feet in September; they agree exactly with specimens I caught in Kandy.

180. *Halpe honorei.*—One male at 2,000 feet in October.

181. *Halpe evershedi,* n. sp.—I obtained two specimens of a *Halpe* in Tiger Sholah in September and there is a specimen in Mr. Evershed's collection; as far as I can ascertain it is different to any species yet described and as Mr. Evershed was the first to capture it I name it after him. My specimens, both males, are closely allied to *Halpe sitala* from the Nilgiris only differing in the following particulars: upperside—no ochreous patch on the hindwing; underside—apex of forewing and disc of hindwing broadly ferrugineous ochreous, this area on the hindwing being crossed by two rows of ill-defined black spots; there are no traces of the white spots to be seen on the hindwing of *sitala* on the underside.

182. *Parnara sinensis.*—Males were fairly common in Tiger Sholah in September but I did not see a female; the local form differs from the North Indian form in having only one, or oftener no spot on the handwing above; on the hindwing below the spot at the end of the cell is always prominent but the discal row is reduced to two or rarely three spots.

183. *Parnara mathias.*—Common at all elevations in May, June, August to November.

184. *Parnara colaca.*—Common at low elevations, August to October.

185. *Parnara bevani.*—Rare, but seems to occur at all elevations in September.

186. *Parnara kumara.*—One female in Tiger Sholah, September.

187. *Hasora chabrona.*—Not rare at high elevations in September and October.

188. *Hasora chromus.*—Common at all elevations in September; Dr. Campbell found it rare in May and June and notes that it appears from 7 to 8 a.m. and from 5 p.m. to sunset.

189. *Hasora alexis.*—Common at high elevations, May, June and Sep-

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tember. At the end of September I found a heliotrope bush swarming with these last three species.

190. *Badamia exclamationis.*—Common at low elevations; August to October.

191. *Rhopalocampta benjaminii.*—Rare at high elevations in September. Caught in Tiger Sholah by Mr. Evershed.

Note on Migrations.

BY

Mr. J. Evershed.

The *Catopsilia* migrations are observed in spring and autumn over the Palnis. In the spring months,—March to June,—*C. crocale*, *C. pyranthe*, *C. catilla*, and occasionally *C. florella*, are seen flying north and north-east. The direction is quite independent of wind and can have no reference to the position of the sun, which may be at or near the zenith in April. They travel at about fifteen miles an hour, more or less, according to the direction of the wind, which may assist or retard their flight. It is remarkable how seldom the butterflies deviate from a constant direction or azimuth although following closely the contours of the ground: woods or small sholas are not avoided, but passed through near the ground if the undergrowth is not too thick, otherwise they prefer to fly over rather than around such obstacles. This habit seems to apply also to much larger obstacles, for the Palni Hills themselves could be avoided by travelling to the east in the plains, before reaching the hills; yet the butterflies may be seen ascending the precipices on the south side of the hills, and heading north immediately on reaching the summits.

These butterflies have not been seen by me in great swarms, as recorded occasionally in the plains but a single observer may count several hundred individuals passing per hour during about four hours in the middle of the day, and the flight may be maintained day after day for several weeks together, if the weather is sunny.

The autumn migrations are observed in October and November, the direction of flight being almost due south. In addition to *Catopsilias* many other species have been observed at this season, in particular *Papilio demoleus* (seen in great numbers in 1908), also *P. hector*, *P. agamemnon*, *Hypolimnas bolina*, *Danais chrysippus*,

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D. plexippus, and *D. septentrionis*, *Junonia hierta*, *J. orithya*, *J. lemonias*, *Atella phalantha*, and a small skipper. Sometimes large numbers of dragonflies accompany the butterflies in the southward flight.

It has been noted that on reaching a bank of fog near the precipices on the south side of the Palnis a specimen of *P. hector* was turned back by it. The instinct impelling a southerly direction of flight was evidently operating even with a contrary wind and clouded sky, but the fog was baffling, and the butterfly had to retreat before it, returning however again and again right up to the edge of the wall of mist.

Towards the end of November 1908 two opposing streams of *Catopsilias*, with a few Danaids and Papilios were observed flying in almost opposite directions, one stream moving south and the other passing through it approximately in the direction north by east. It was noticeable that the butterflies showed not the slightest indecision or confusion at the crossing point, each individual maintaining its original direction of flight quite independently of the others. It is evident, therefore, that the instinct is not in any way dependent on numbers, but operates separately in each individual.

A feature of the autumn migration of 1909 was the very large number of the skipper *Parnara mathias* which accompanied the other species.

These migrations appear to occur over the whole of the grassy upland region of the Palnis, where very few of the species breed. Apparently the butterflies ascend from the plains on one side of the range, cross the hills, and descend again on the opposite side; but I have been unable to discover how far the flights are continued in the plains. *P. demoleus* has been observed migrating in large numbers a dozen miles or so to the south-east of the Palnis at the same time that the migration was in progress on the hills.

Co-operation by observers in other stations is much to be desired in order to trace out the whole course of a migration, and it is possible that systematic observation over extended areas might throw much new light on the origin of this mysterious instinct.

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THE NATURAL HISTORY OF BOMBAY MALARIA

BY

CHARLES A. BENTLEY, M.B., C.M. (Edin.),

D.H.P., D.T.M.&H. (Camb.).

(*With Plates I and II.*)

Natural History can show no more fascinating story than that of the discovery of the Malaria Parasite, and the part played by the mosquito in its transmission from man to man. Laveran and Ross to whom we are indebted for this knowledge were medical men, but they were naturalists too; and the discoveries they made would have been impossible but for this fact. Not so very long ago a student of Natural History was looked upon as a crank who delighted in collecting all sorts of specimens and pursued a study which ordinary people considered largely a waste of time; now-a-days it is recognised that the whole science of Preventive Medicine, especially as it relates to the problems of Tropical Disease, is based upon the work of the one-time despised Naturalist. This being so, I need offer no apology for addressing this Society upon such a subject as The Natural History of Bombay Malaria, for Malaria is as much a matter of interest to the student of Natural History as to the medical man.

In 1880 Laveran found when examining the blood of persons suffering from malarial fever that small motile bodies could be seen in the red blood corpuscles of the patients. Some of the bodies were exceedingly minute and quite colourless but others were nearly as large as the blood corpuscles themselves and contained grains of blackish pigment in rapid motion. By a careful study of these bodies at all stages in an attack of fever Laveran was able to show that the occurrence of febrile paroxysms bore a direct relation to the development of the organism which he was observing. Thus just before the onset of an attack of ague, numerous large pigmented parasites were to be seen; but at the moment when the first symptoms of shivering occurred, examination of the blood showed that these large pigmented parasites were dividing up into minuter forms and their pigment was being set free in the blood. A little later in the attack the larger parasites

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had mostly disappeared and small unpigmented parasites were present in many of the corpuscles of the patient. Laveran deduced from these observations that the organism he had been studying was the cause of malaria, and that the actual onset of an attack of fever took place when large mature parasites were reproducing themselves by a process of sub-division or shizogony.

Several different forms of malarial fever have long been recognised. The commonest is the so-called Tertian Ague, characterised by recurring attacks of ague and fever every third day. That is to say a man who had an attack on Monday might be quite free of fever on Tuesday, but would have a recurrence of symptoms on Wednesday and so on. Another form is Quartan Ague, in which the attack occurring on one day would be followed by two days of freedom from symptoms with a recurrence on the fourth day.

A third and more severe kind of Malaria takes the form either of a continued fever or a series of recurring paroxysms every third day. In the latter form each paroxysm usually lasts for from twenty-four to thirty-six or more hours, so that there is usually only a short interval between them. This kind of Malaria is called Malignant Tertian Fever.

Since Laveran's original discovery of the malarial organism it has been found that each of these types of Malaria is due to a different species of parasite, and it has been definitely proved that each phase of an attack of Malarial Fever is related to a corresponding stage in the life-cycle of the organism associated with it. For nearly twenty years after Laveran published his discovery nothing was known as to the manner in which the parasite gained entrance to the blood of man; and though the life history of each of its forms was carefully worked out by numerous observers, and it was found that they could exist and continue reproducing themselves for long periods in the blood of infected persons, no one was able to cultivate them or to keep them alive for more than a very short time outside the human body; neither had any one been able to trace the presence of the organism in the air, the soil or the water of malarious countries. But it had long been noticed that among the parasites present in the blood of sufferers from Malaria there were often large pigmented forms which were of a

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very peculiar crescent shape in the case of Malignant Tertian Malaria; and circular or oval in shape in the case of Quartan and Tertian Ague. These forms of the parasite did not undergo subdivision in the blood; but some of them underwent a peculiar change known as flagellation in blood drawn from the body and kept under certain conditions for a short time.

As these peculiar forms did not appear to bear any definite relation to symptoms of fever some observers supposed that they were merely degenerating parasites, and some that they represented a resting stage of the organism, but others hazarded the opinion that they were connected with the transmission of the infection, though in what way they could not explain.

In 1898 Ross who had been experimenting with mosquitoes for a number of years at the suggestion of Sir Patrick Manson, made the momentous discovery that when mosquitoes of a certain species were allowed to bite sufferers from Malaria in whose blood these special forms of the parasite were present, the latter instead of being digested or disappearing, underwent a change and penetrating the stomach wall of the insect became encysted there. Continuing his observations Ross found that these encysted parasites which took the form of small tumours in the wall of the mosquitoes' stomachs, rapidly grew larger and larger until they were many times the size of the original parasite; and gradually as they increased in size the character of their contents changed also, until they appeared to be packed with thousands of little spindle-shaped bodies. Following them a stage further Ross discovered that after a time the cysts burst and discharged their contents into the body-cavity of the mosquito, and that finally many of the little spindle-shaped bodies were carried to the salivary or poison gland of the insects.

In this way one of the most remarkable zoological researches was brought to a successful conclusion. For Ross showed that the large pigmented parasites which did not undergo division in the human body but which when taken into the stomach of an anopheles mosquito commenced to develop there, were sexual forms of the malarial organism which required to enter a new type of host before they could combine and complete their cycle of

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development, and produce the generation of sporozoits whereby the continuation of the species might be secured.

Besides solving a problem of the greatest interest to all naturalists, Ross' investigation supplied the answer to a riddle which had baffled medical men for hundreds of years; and what was still more important, placed in the hands of the sanitarian a new weapon by which he could attack the greatest scourge of human existence in tropical and sub-tropical countries, with some hope of success. For the discovery that anopheles mosquitoes became infected with malaria by sucking the blood of sufferers from the disease and that subsequently these infected mosquitoes became capable by their bite of transmitting the parasite to healthy persons, offered to all those who care to avail themselves of the knowledge, a certain method of escaping the disease by protecting themselves from mosquitoes, and at the same time suggested a protective measure of wider scope, the reduction or suppression of anopheles mosquitoes, by the adoption of which whole communities may benefit.

We may note that, malaria first became of interest to naturalists when Laveran, by his discovery of the malarial organism, showed that the disease was caused by the action of a minute animal parasite. Subsequently this interest was stimulated into activity by Ross' remarkable demonstration of the part played by mosquitoes in the transmission of this parasite from man to man and the result has been the foundation of modern Tropical Sanitation, which is largely based upon a knowledge of the natural history of insect pests and animal parasites.

In discussing the Natural History of Malaria the subject may be approached from several different points of view. We can study the malarial organism as a type of the minute animals called by zoologists Sporozoa, a sub-class of the unicellular animals known as Protozoa. Or we may take up another aspect of malaria and study the anopheles mosquito, the alternative host of the parasite, which is transmitted by its bite from man to man.

It is with this latter aspect of malaria, particularly as it affects Bombay, that I am concerned at present; but in a discussion of this subject I find myself considerably handicapped by having to

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traverse almost the same ground as that covered by Captain Liston, I. M. S., in a paper read before this Society (Bombay Natural History Society in November 1908, *vide* Journal, Vol. XVIII, pp. 872-881. Those of you, who take an interest in the question of Bombay Malaria, would do well to read this paper, if you have not already done so, as it gives an exceedingly clear exposition of the more important points in the lifehistory of the malarial parasite in man and in the mosquito, and deals also in a very practical manner with the problem of malaria prevention. But there is another reason why I must direct your attention to Captain Liston's paper, because it contains the first announcement of a discovery regarding malaria of the greatest importance to the citizens of Bombay. This discovery relates to the species of mosquito concerned in the dissemination of malaria in the City. Briefly, Captain Liston, while investigating conditions in the Frere Road at a time when malaria had become epidemic there, found that only two species of anopheles mosquitoes were present in that locality. These two species were * *Nyssorhynchus stephensi* and *Myzomyia rossi*. Now, although it had been shown experimentally that both of these mosquitoes could be infected with malaria in the Laboratory, neither of them had been shown to transmit malaria in nature, and the careful examination of many hundreds of specimens of *M. rossi* in various parts of India had failed to show a single infected insect. And although *N. stephensi* had received less attention than *M. rossi*, it had likewise never been shown to be really concerned in the dissemination of malaria until 1908, when Captain Liston discovered that it was responsible for the spread of the disease in the Frere Road.

Since Captain Liston's original observation the examination of nearly a thousand mosquitoes caught in the Frere Road has fully confirmed his conclusions, *N. stephensi* being found infected with

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* I have just been informed by Major S. P. James, I.M.S., that the mosquito formerly described under this name is now to be placed in the genus *Neocellia* and Mr. Theobald, the well known authority in mosquitoes, has agreed with him that this is the better classification.

In future, therefore, *N. stephensi* will stand for *Neocellia stephensi* rather than *Nyssorhynchus stephensi*.

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malaria parasites and *M. rossi* quite free of infection. It has also been shown that the former anopheles is present not only in the Frere Road area but in lesser numbers in very many parts of the City, and wherever it occurs inquiry demonstrates the existence of malaria among the population. This being so, it becomes necessary to learn as much as possible about this particular species of mosquito, in order that measures may be taken for its control, in the hope that the spread of malaria in the City may be prevented.

But many people are sure to ask the question—"*how can we be certain that by taking steps to suppress or reduce the numbers of N. stephensi we may really influence malaria in Bombay?*" The answer to this question depends primarily upon the reply which may be given to certain other questions :—

(1) Whether or not malaria can be conveyed by any other agency than mosquitoes?

(2) Whether any kind of mosquito other than those belonging to the anopheles family can contract malaria and transit it again to man?

(3) Whether all species of anopheles mosquitoes are dangerous or whether only certain species can act as natural carriers of malaria?

In reply to question (1) we may point out that we have conclusive evidence that malaria parasites can be conveyed from an infected person to a healthy one by the agency of anopheles mosquitoes, and there is not one atom of evidence to show that malaria is contracted in any other way than by the bite of an infected anopheles. *Thus it is a question of demonstrated fact against pure speculation.*

In regard to question (2) it may be remarked that at present all the evidence is in favour of the conclusion that anopheles mosquitoes alone are responsible for the spread of human malaria, no one having as yet brought forward a single observation incriminating any other family of mosquitoes.

In regard to question (3) it may be pointed out that the balance of evidence is in favour of the conclusion that different species of anopheles mosquitoes are not equally dangerous; and that while some species carry malaria readily others do so with difficulty

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or not at all. As a result of some thousands of observations upon one species, *M. rossi*, we are justified in concluding that it takes no part in the dissemination of malaria.

In view of these facts, it becomes necessary for us to learn as much as possible about the mosquitoes, particularly the anopheles mosquitoes, of Bombay; and the question as to whether or not malaria can be reduced or eradicated from the city can only be answered by those who have sufficient knowledge of the natural history of its mosquitoes.

Now a careful examination of a considerable portion of the island has shown that there are five species of anopheles mosquitoes present:—*N. stephensi*, *N. jamesi*, *M. barbirostris*, *M. culicifacies* and *M. rossi*.

The latter species of anopheles, which as I have mentioned previously, does not appear to be concerned in the dissemination of malaria in any part of India, may be found in large numbers in every part of the island. The other species are present in much smaller numbers and appear to be more or less restricted to certain localities. *N. stephensi* can be found with varying frequency in nearly every part of the southern portion of the city, but appears to be absent from the north of the island. *N. jamesi* occurs at Malabar Hill, the neighbourhood of the Gowalia Tank, the Mazagaon reservoirs, and in other places in the centre and north of the island. *M. barbirostris* may be found in scanty numbers in the south of the island, but is fairly common in the northern half. *M. culicifacies* has only been found in about a dozen places in the north of the island. In the majority of cases where *N. jamesi* and *M. barbirostris* have been found breeding in the south of the island, they have occurred in association with *N. stephensi*.

M. culicifacies has long been known as a dangerous carrier of malaria, and as I have already pointed out, we now know, thanks to Captain Liston, that, *N. stephensi* is also an active agent in the propagation of the disease. Both *M. barbirostris* and *N. jamesi*, though potential carriers, do not appear to be very dangerous ones, and fortunately they only occur in scanty numbers in the city proper. Practically, then, we are justified in assuming that over the greater part of Bombay we have only to deal with one dangerous

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species of anopheles, *N. stephensi*, and if we can devise efficient measures for reducing the numbers of this mosquito, we shall in all probability greatly lessen the incidence of malaria among the population.

This fact is of great importance, for there are many different species of mosquitoes in Bombay, which swarms with *Culex* and *Stegomyia* and *Anopheles*: and it is only when we clearly realize that only one mosquito is really responsible for the spread of malaria in the greater part of the city that we can understand why it should happen that there is often very little of the disease in places where there are millions of mosquitoes. I wish to lay stress upon this point, because there are many people who fail to understand how mosquitoes can possibly be concerned in the spread of malaria when their own experience is that there is often little malaria where there are many mosquitoes and much malaria where there are few mosquitoes.

In Bombay the mosquitoes concerned in the spread of malaria represent only a fractional proportion of the total insects. This being so, those who wish to avoid malaria, or whose duties render it necessary to attempt the reduction of the disease, must be in a position to recognise the dangerous species.

Although it is very easy to distinguish between *Anopheles* and *Culex* or *Stegomyia* mosquitoes, it is by no means so easy to recognise the different species one from another or to separate the dangerous anopheles, *N. stephensi*, for instance, from the harmless anopheles, *M. rossi*.

As a matter of fact, it often happens that these two species are confused the one for the other. This would not matter so much, if it were possible with the funds usually allotted for the purpose to destroy or reduce the numbers of every kind of mosquito. Unfortunately the amount of money that a city like Bombay is prepared to spend upon this kind of work at present will not allow of this, so that it becomes a matter of importance that when anti-mosquito measures are undertaken for the avowed object of reducing malaria, money should be spent in such a way as to achieve its purpose, rather than in the mere destruction of a certain number of mosquitoes, many of which have nothing to do

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with the spread of the disease. This makes it necessary that as many people as possible should learn to recognise a really dangerous anopheles mosquito when they see it.

With a very little practice, anyone who has learned to distinguish Anopheles mosquitoes from the ordinary Culex and Stegomyia can easily learn to tell the dangerous anopheles of Bombay from the harmless *M. rossi*. It is most important that people should know *N. stephensi* when they see it and the other species of anopheles are not difficult to recognise also.

The Recognition of Bombay Anophelines.

Every one should learn to clearly distinguish between Culicine and Anopheline mosquitoes. In Bombay the following points will help people to say whether a mosquito is an anopheles or not :—

Examine and note—

(1) *The attitude.*—Culex and Stegomyia mosquitoes, when resting, keep their body nearly parallel with the surface upon which they are sitting. Anophelines rest with their tails raised higher than their head.

(2) *Shape.*—Culex and Stegomyia mosquitoes have a hump-backed appearance. Anophelines have straight backs and keep their bodies and their proboscis in a straight line.

(3) All Culex and Stegomyia mosquitoes in Bombay have clear looking wings. All the Bombay Anopheles have spotted wings.

Note.—There are some species of Culex in India that possess spotted wings but none of these have been found in Bombay. People must carefully distinguish between the black and white Stegomyia mosquito common in Bombay, which has white marks on its body and legs but clear looking wings. Many people mistake these mosquitoes for anopheles.

M. rossi.

The adults of this species of anopheles mosquito can be caught fairly easily almost anywhere in Bombay. They are fairly large in size and usually a light brown in colour with the wings covered with black spots. The female mosquito can easily be identified by the naked eye, but those who are not expert are recommended to

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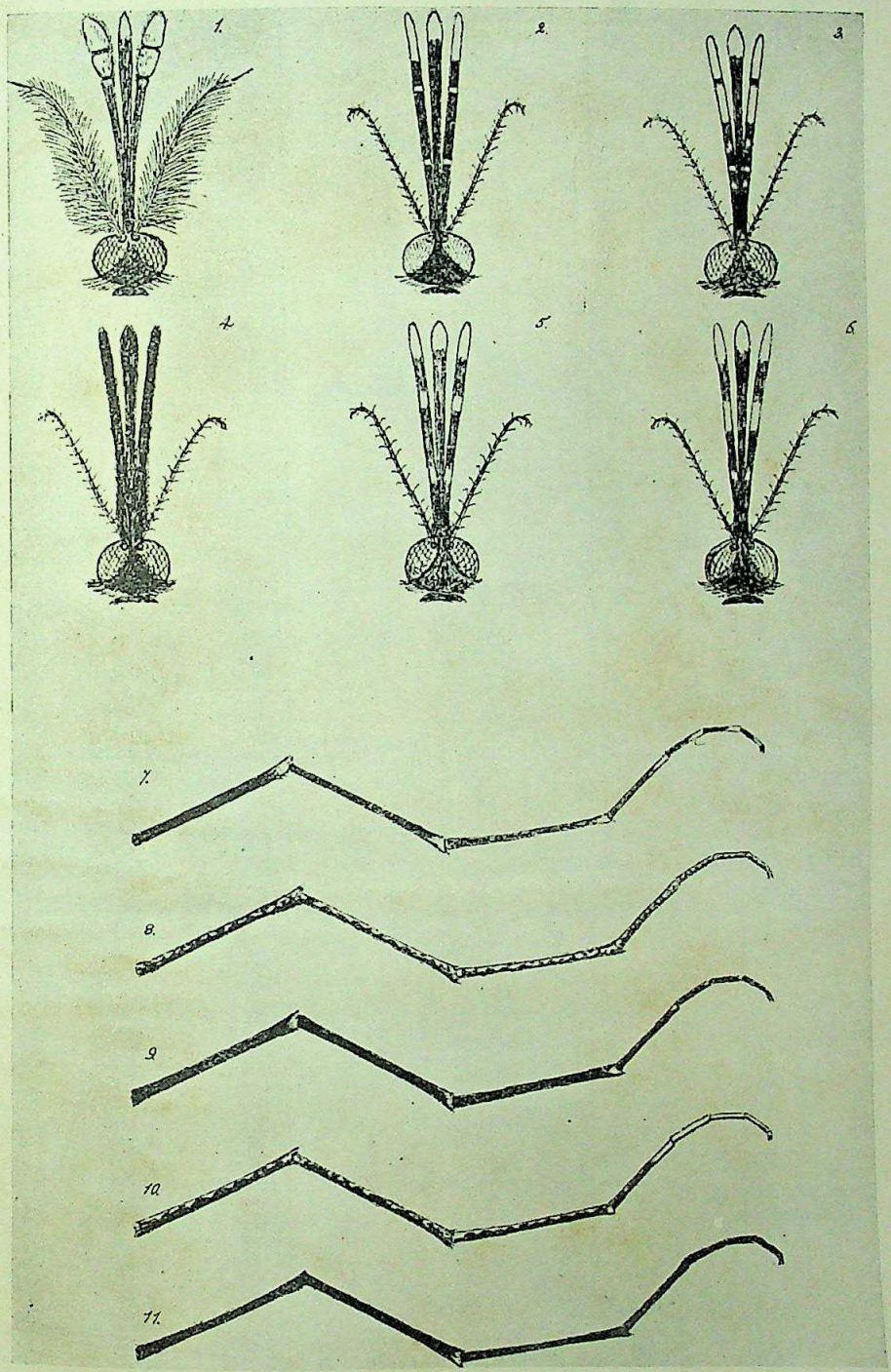

Heads and legs of Bombay Anopheles Mosquitoes.

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make use of a small magnifying glass and to note the following points :—

Examine the palpi and note that they are covered with black scales except at three points, the tip, at which there is a broad band of white, and two other areas which show very narrow white bands. (*N. stephensi* has two broad white bands, one narrow one and a few scattered white scales on each palpi.)

Examine the legs and note that they are a uniform dark brown colour except at the joints where they are clearly banded with white. (*N. stephensi* has fine white speckles all over its legs).

N. stephensi.

The adults of this species resemble *M. rossi* very closely at first sight, and the males are not easy to distinguish except by the speckling of the legs. They are slightly greyer in colour than *M. rossi*. The female mosquito can be readily identified by the following points :—

Examine the palpi and note that they possess two broad white bands, one at the tip and another close to it. A third very narrow white band is present a little lower down, and there are often a few irregularly scattered white scales among the black scales of the palpi. Examine the legs and note that they are thickly speckled with white scales which give them a greyish appearance to the naked eye.

M. barbirostris.

This mosquito is quite unmistakable, as it is almost always a deep black in colour, and suggests at once a mosquito in mourning. There are a few whitish scales on the wings, but they are hardly noticeable except to close examination. The palpi and proboscis are very long and densely scaled, often appearing nearly as long and thick as the abdomen of the insect.

Examine the palpi and note the thick black scales and the absence of white bands. Sometimes there are a few white scales at the very tip but quite often they are absent.

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Examine the legs and note that they are almost uniformly black, but that there are a very few white scales at the joints, too scanty to form bands of white such as may be seen on the legs of *M. rossi.*

N. jamesi.

This mosquito is usually of a dark grey or general blackish colour, and is smaller than either *M. rossi, N. stephensi* and *M. barbirostris.* It has a peculiar habit when sitting upon the wall of a tube or other object of gently waving its hind legs in the air. A most noticeable point is that the end of these hind legs is pure white in colour.

Examine the palpi and note that there are three white bands present, a broad one at the tips and two narrower ones lower down. The two latter are not however usually so fine as those present in *M. rossi.*

Examine the legs and note (1) that they are covered with very fine white speckles not quite so marked as those present in *N. stephensi*; (2) there are distinct white bands at the joints of the legs; and (3) *the last three joints of the hind legs are quite white.*

M. culicifacies.

This mosquito is much smaller than the other species of anopheles to be found in Bombay, and is usually rather a darkish grey in colour. It received its name from the fact that it does not assume quite so peculiar an attitude as most anopheles mosquitoes, and instead of raising its tail high in the air it keeps its body more nearly parallel to the object upon which it is sitting, resembling culex mosquitoes in this respect.

Examine its palpi and note that they have three fairly narrow white bands upon them, one at the tip and the others at intervals lower down.

Examine the legs and note that they are quite black or blackish brown in colour except for a very few white scales at the joints. There is no speckling of the legs as on *N. stephensi* and *N. jamesi*, neither is there any banding of the legs as in *M. rossi.*

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Anopheles Larvæ.

It is also possible to distinguish between the larvæ of these different species of anopheles, and this is rather an important point, because we can usually find and capture mosquito larvæ more easily than adult insects, which are often rather difficult to catch. Of course, it is a very simple matter to breed out mosquitoes from any larvæ that we have obtained, but it is very useful to be able to recognise the species to which they belong without going to all this trouble.

Captain Liston in the paper to which I have already alluded, pointed out that a knowledge of the habits of mosquitoes soon teaches us that each species usually selects particular types of breeding places. This is quite true when we are dealing with natural breeding places, but we cannot absolutely depend upon such a rule in Bombay, where almost all the breeding places are of an artificial nature. Thus the five species of anopheles to be found in Bombay—all make use of wells for breeding places—and although it is possible to recognise the larvæ of *N. jamesi*, *M. culicifacies* and *M. barbirostris* with the naked eye, it is impossible to tell the larvæ of *N. stephensi* apart from those of *M. rossi*, except by the use of the microscope. We may lay down, however, certain general rules which will help us in many cases. Thus when we find anopheles larvæ in foul wells, puddles of dirty water or in liquid sewage, we may be almost certain that we have to do with *M. rossi* and not with the other and more dangerous species. If we find anopheles larvæ breeding in the weedy part of a tank, among the grass close to the edge, it is very probable that they will turn out to be *N. jamesi*, and we can be almost certain of this when they have a slightly brownish colour and present a rather hairy appearance. *M. barbirostris* larvæ may be found in the darker and deeper parts of such a pond especially where it is overshadowed by trees, and it is very common in some of the large open wells in the northern part of the island, The larvæ are generally very dark in colour, often almost black, and they usually have two whitish marks across the back. They do not taper so much towards the tail as many of the other larvæ do, the smaller ones often appearing to be almost the same width from the thorax downwards. The larvæ of

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M. culicifacies usually present a short stumpy appearance, the abdomen being only about twice as long as the breadth of the thorax. At first sight they almost look as though the last segment or so of their bodies had been cut off. The larvæ of *N. stephensi* and *M. rossi* are very much alike and vary a good deal in colour according to the tint of the water in which they are living. *M. rossi* especially presents some extraordinary variations in colour, sometimes being quite black, at other times bright green and in certain places quite a red colour. Usually, however, it is a dirty grey or earth colour. Frequently among a batch of larvæ some will be seen with an almost white or colourless head which gives them a peculiar appearance and causes people to imagine that they must belong to a different species.

But though experience will enable us to make a good guess at the species of larvæ which we may find we can only make quite certain either by breeding out some adult insects or else by very carefully examining the larvæ under the microscope with a $\frac{2}{3}$rd inch and $\frac{1}{6}$th inch objective. If we can do this the following points will enable us to say to what species of anopheles the larvæ belong :—

If we place an anopheles larvæ upon a slide in a drop of water covered with a cover glass and examine it with a low power ($\frac{2}{3}$rd inch objective) we shall note the roundish head with blackish markings which often form a sort of pattern. At each side of the head the antennæ project forward like horns and immediately in front of the head we can distinguish the feeding brushes. The head of the larva is attached to the thorax which is broad and solid looking and behind the thorax extends the abdomen formed of eight tapering segments. Both the thorax and the abdominal segments have a number of long spiny and branched hairs projecting from their surface, but if we look very closely we shall note that on a number of the abdominal segments there are small beautifully shaped fans which can be folded up or opened. It is by the characteristic shape of the palmate leaves which form these fans, together with certain peculiar hairs which are present on the forehead of the larvæ that we are enabled to identify the species of anopheles to which they belong.

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Let us return for a moment to the head of the larvæ. If we examine it under the $\frac{2}{3}$rd inch objective we shall see that it possesses a sort of blunted cone-shaped forehead or clypeus, below the angles of which project the feeding brushes which have very much the appearance of shaving brushes. From the upper surface of the forehead or clypeus just between the feeding brushes we can note certain spines or hairs projecting. A pair of long hairs and a pair of shorter ones can usually be distinguished. Now these hairs differ in character in different species of anopheles larvæ and in examining such larvæ we should always take special note of them.

In order to differentiate larvæ in this way we must make use of a higher power objective than $\frac{2}{3}$rd inch. With a $\frac{1}{6}$th inch objective we can note the following differences in the leaflets of the palmate hairs on fans on the abdominal segments and the frontal or clypeal hairs respectively observable in the larvæ of species of anopheles mosquitoes to be found in Bombay.

M. rossi.

Place the larvæ in a drop of water on a slide, cover with a cover glass and examine with a $\frac{2}{3}$rd inch objective. Find the frontal hairs and then use a $\frac{1}{6}$th inch objective. Note two pairs of frontal hairs, a longer pair placed internally with a shorter hair on each side external to these. Focus very carefully and note that there is no lateral branching of these hairs.

Palmate hairs or fans.—Replace the 2-3rd inch objective and move the specimen until one of the palmate hairs or fans is in view, then focus with the 1-6th inch objective. Note that the fan is made up of a number of finely tapered leaflets joined at the base to a common arm which is attached to the upper surface of the abdominal segment. In *M. rossi* each separate leaflet is usually very finely tapered and extended into a long spine or filament which is as long as the broader body of the leaflet.

N. stephensi.

Examine the larvæ in the same way but note that :—

Frontal Hairs.—Though at first sight closely resem-

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bling those of *M. rossi* possess very fine lateral branches.

Palmate Hairs.—Note that in these the body of the leaflet is at least twice as long as the spine or filament and that instead of being finely tapered off it frequently looks rather rough and broken. In old larvæ the upper portion of the leaflet is usually much darker in colour just at the point where the filament joins it.

M. barbirostris.

Examine the larvæ and note that the internal pair of frontal hairs are very long and often appear to cross one another at the tip. Sometimes they have one or more very fine branches. The external frontal hairs are possessed of numerous branches like the branches of a tree or bush. It is sometimes difficult to see them on account of the projection of the feeding brushes. If we examine the antennæ of a larvæ of *M. barbirostris* we shall also find a somewhat similar branched hair projecting from its inner surface about half-way up.

Examine the palmate hairs or fans which are present on each side of the abdominal segments. In larvæ of this species found in Bombay there is also a pair present on the thorax. The individual leaflets of the fans are rather large and coarsely tapered to a point and are not extended into any marked filament or spine as in the case of most other larvæ.

N. jamesi.

Examine the larvæ and note that the frontal hairs have a large number of fine lateral branches all the way up. These are to be seen on both internal and external frontal hairs. The palmate hairs or fans are very large and distinct, with rather wide broken-looking and slightly pigmented tops and a mediumly long spine or filament.

M. culicifacies.

Examine the larvæ and note that the internal frontal hairs are rather short and possess one or two fine lateral branches

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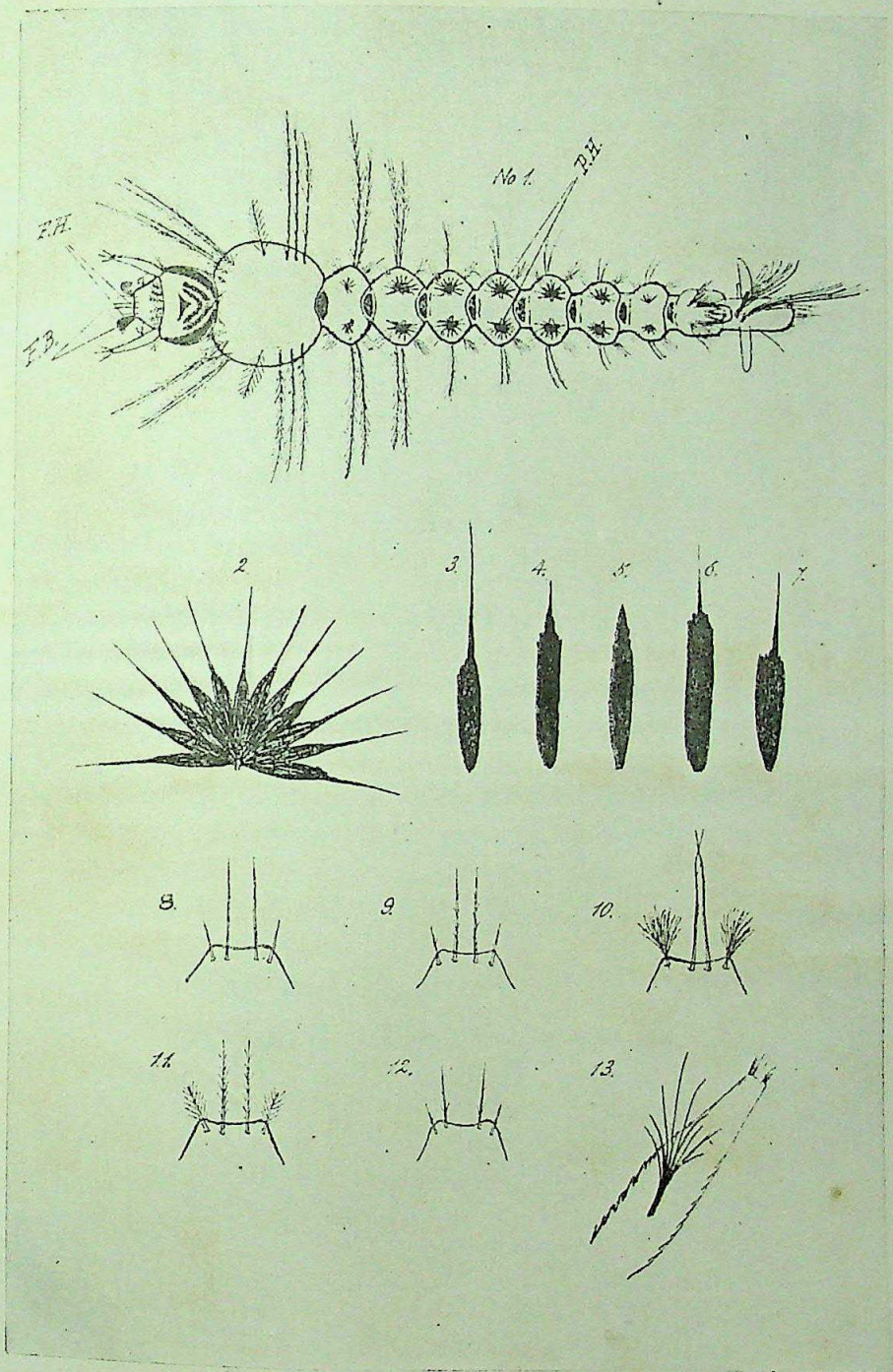

Larvæ of Bombay Anopheles Mosquitoes.

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very like those seen in the larvæ of *N. stephensi* but usually a little clearer and longer. The external frontal hairs are also often slightly branched or frayed but sometimes appear almost plain. Examine the fans or palmate hairs and note that they are large and prominent. A pair is present on the thorax. The ends of each leaflet is broad, broken-looking and slightly pigmented as in *N. jamesi* and the spine or filament is of medium length.

Breeding Places of N. stephensi.

As I have already pointed out the commonest dangerous anopheles in Bombay is *N. stephensi* and if we wish to reduce the number of this species and so lessen the chance of the spreading of malaria, we must know a good deal more about the habits of this mosquito and the places in which it breeds so that we can attack it with some hope of success.

Last year shortly after the commencement of the present enquiry, it became apparent that the breeding places usually selected by *N. stephensi* could be roughly divided into two classes :—

(1) Those that were permanent.

(2) Those that were temporary.

The permanent breeding places take the form of wells, tanks, iron cisterns, fountains and garden tubs. The temporary breeding places usually consist of surface pools of rain-water that collect in the monsoon, tin-pots, hollows in machinery, kutcha and pucca drains containing clean rain-water, &c. In regard to these two types of breeding places, it is possible to lay down certain definite rules :—

(1) Larvæ of *N. stephensi* are practically never found in really foul or dirty water.

(2) Temporary breeding places only appear to become infected with larvæ of *N. stephensi* when permanent breeding places exist in their vicinity.

The point regarding dirty water is of importance because a great many people imagine that dirty puddles in the streets, of foul water in gully and drain traps is a source of malaria. This is not the case, because, though some kinds of mosquitoes will breed in

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places of this sort, the species concerned in the spread of malaria depend upon clean water for breeding purposes. One of the main reasons why the centre of towns and cities is often comparatively free of malaria is because the surface water speedily becomes too foul and dirty to allow of the breeding of dangerous anopheles; but if wells and cisterns and tanks of clean water are present malaria may occur and when it does so ignorant people ascribe it to bad smells, decaying organic matter and impure water.

In order to give you a clear idea of the kind of breeding places that are selected by *N. stephensi* I will mention some of the places in Bombay in which I have found the larvæ of this mosquito.

Permanent Breeding Places.

Among permanent collections of water I have found them most frequently in wells. Out of nearly 4,000 wells they have been present in about 1,200. In no case have they been found in wells containing foul stinking water.

Bombay possesses an exceedingly large number of wells, probably not less than 7,000. At one time these formed the sole water-supply of the island, but since the introduction of a pipe water-supply many of them have gone out of use and they now constitute a serious danger to the health of the inhabitants. Many of the wells in the older parts of the City are inside the houses. These are either placed in a dark basement, where one requires a lamp in order to examine them, or else below a central shaft running right up through the house and either open to the sky or lighted by a sky-light. Generally this central shaft is overlooked by landings on each floor or else windows or doors are so arranged that people can lean over and by letting down a vessel attached to a rope can draw water without descending to the well mouth. No doubt this arrangement was very convenient in the old days and saved people much trouble in drawing water for the upper floors of lofty houses, but it is difficult to conceive of a more ideal arrangement for the spread of malaria when anopheles mosquitoes, capable of transmitting the disease, are breeding in the wells and can find access to numbers of people living on each floor of the house, which is usually rge and divided into a number of different tenements.

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Some wells are not placed within the house but in a small yard at the back or in the compound, but many of them are so arranged as to be overlooked by windows specially made for the purpose of drawing water. In the northern portion of the island wells are usually in gardens or compounds and were once used largely for irrigation purposes, being surrounded by pucca tanks and water channels. Wells of this kind are generally very large and deep, some being as much as 25 ft. in diameter and from 50 to 100 ft. in depth.

N. stephensi has been found breeding in wells of every sort, but the darker wells inside the houses generally appear to be the most dangerous. They have been found in wells so shallow that it was quite possible to see the bottom and in others with a depth of from 20 to 30 ft. of water; they have also been found in wells where the water was far below the surface of the ground quite as often as in wells where the water was almost within reach of the curb; they often occur in wells containing much weed and floating matter but not infrequently they are present in wells in which the water appears absolutely clear. Wells in frequent use have often been found to contain them in spite of statements to the contrary.

Iron cisterns come next in importance to wells among permanent breeding places of *N. stephensi*, and altogether some hundreds of cisterns have been found to contain larvæ of this anopheles. Some of these cisterns are open ones but the majority are the usual covered cisterns found all over the city. Very few cisterns of this type are properly closed, and although they generally possess lids or man-hole doors, the lids rarely fit, and the man-hole doors are either left open or lost. During the monsoon I visited a very large number of modern houses with terrace roofs, and in many cases I found that nearly every cistern on the roof was breeding *N. stephensi*. This being so it is not surprising that residents in such houses should frequently suffer from malaria, because among the native servants who almost invariably live under the same roof, a certain proportion are sure to harbour malarial infection and with malaria-carrying mosquitoes breeding in the water-supply cisterns on the premises, there is every chance for the spread of malaria among the inmates.

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In Bombay, public fountains also seem to be a favourite breeding place of *N. stephensi*, and the people who live in the neighbourhood of these fountains should remember this fact, for during the course of last year nearly every fountain in the street was found to be infected.

Neglected private fountains, garden tanks and mali tubs are also a source of danger, but it often happens that the people to whom they belong escape the consequences of their carelessness and their neighbours suffer instead. This fact was very forcibly brought to my notice on one occasion when I was visiting certain houses in the neighbourhood of Apollo Bunder. I had called at one house and obtained permission from the tenant of the top floor to examine the house cisterns. While talking to him he alluded to the fact that he had been suffering repeatedly from malaria for the past two years, the period during which he had lived in the house. Previously when staying in another part of Bombay he had kept quite free of fever for many years. On hearing this I asked permission to see his bedroom in order to look out of the windows. At the first glance I noticed a small round tank in a garden immediately below the windows. This garden belonged to another house. No mosquitoes were breeding on his premises so I visited the tank in the neighbouring garden and found it swarming with thousands of larvæ of *N. stephensi*. In another case the occupants of a house, anticipating my visit had caused their mali to fill in a small fountain with earth but a little of the water still remained round the edges and this contained many larvæ of *N. stephensi*, showing the condition that had existed previously.

Temporary breeding places.

Now every one knows that the temporary pools of water that collect during the monsoon become stocked with thousands of mosquito larvæ, and in past years it has often been the custom to attribute the presence of malaria in Bombay to the existence of numbers of pools of water of this kind. I have even heard it gravely stated that the whole of the malaria in the City was due to the collection of stagnant water on the Flats and the presence of the storm-water reservoir at Mahaluxmi. But it is an interesting

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fact and one of considerable importance in relation to malaria prevention in Bombay, that temporary pools and collections of water only appear to become infected with the larvæ of the malaria-carrier *N. stephensi* when permanent breeding places of that mosquito exist in their immediate neighbourhood. Thus in the monsoon while numerous pools of fresh rain-water in the New Dock Works contained great numbers of larvæ of *N. stephensi*, it was impossible to find the insect breeding in the countless pools of rain-water to be found in Byculla and other areas in the centre of the island. The only explanation that I can offer for this condition of things is that, in Byculla and the centre of the island there are few wells and other permanent breeding places suitable for *N. stephensi*, which as a result is almost non-existent there: the scores of pools in that part of the island remaining uninfected because of the absence of permanent breeding places of this mosquito.

Whether or not this is the true explanation I cannot say, but the fact remains that the vast majority of pools in the north of the city do not appear to be a danger from the point of view of malaria. This is proved by the fact that not more than 1 per cent. of the people living in the neighbourhood of Gilder Street and Jacob Circle are infected with malaria whereas from 40 to 50 per cent. of the people residing in the neighbouring of Frere Road harbour the malarial parasite. In the neigbourhood of Frere Road there are wells, fountains, cisterns and tanks which have probably formed permanent breeding places for *N. stephensi* for many years, and when increased facilities for its breeding were afforded by the numerous pools of water which formed in the enclosure of the New Dock Works during the monsoon, it was enabled to take advantage of them with disastrous results to residents in that neighbourhood.

Minor temporary breeding places.

In giving a list of places in which *N. stephensi* could often be found breeding, I mentioned, tubs, tin-pots and other miscellaneous collections of fresh water. But what I have just told you about the temporary pools of water becoming dangerous only in the presence of permanent breeding places of *N. stephensi* holds good in regard

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to these also. Wherever numerous wells, cisterns and tanks infected by this mosquito are found to exist, old tin-pots, collections of water on pieces of old machinery, disused mortar mills, stone troughs and everything that can hold a little fresh water for a few days, is very likely to be found to contain larvæ during the rainy season. Thus I have found them in pigeon troughs in the street, in tins and old cans in back-yards, in old paint pots, and in little collections of water in the hollows and crevices of both old and new machinery.

On several occasions I have found that paint pots and tins left on the roofs of houses in which painters had been working, had become most prolific breeding places. In one case twenty such tins were present on a roof, all breeding these mosquitoes, and the tenants of the top floor complained of having suffered considerably from fever, which they put down to "bad smells" and the existence of dirty puddles in the street. In another case I found that some one was keeping fowls on a terrace roof and tins and tubs of water were placed there for their use. The tubs and tins supplied the fowls with water and the household with malaria-carrying mosquitoes. Several times I have come across charming little terrace gardens nicely arranged on the roof of a house, and nearly always providing a selection of breeding places for *N. stephensi* in the shape of tins, tubs, and pots wherein water was allowed to remain. Two or three times large tin baths have been found upon terrace roof, forming excellent breeding places for *N. stephensi*, larvæ of which were present in large numbers. These observations show that terrace roofs may form a considerable source of danger in assisting the spread of malaria, when made use of as a sort of elevated back-yard or lumber store.

Special Breeding Places.

Besides the breeding places of which I have spoken Bombay possesses certain special ones of which every one should know. Among the more important of these are the two reservoirs which supply Bombay with water. At Mazagon the Bhandarwada reservoir is provided with a number of open sand filter beds each with its cushion well. Now these filter-beds seem to be just adapt-

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ed for the breeding of *N. stephensi.* A few months ago when I examined these filters I found every one breeding thousands of these mosquitoes, and by using a muslin net which I drew along the edges of the filter beds I was able to collect a large number of them. At the time the larger reservoir which is underground, was undergoing repairs and was empty; but in a number of little pools of water on the floor I found many specimens of *N. stephensi.*

In Malabar Hill too I found the same mosquito breeding in the reservoirs and filters in spite of the fact that they are under cover. One of the filter beds which has been out of use for a long time on account of leakage, had its cushion well positively swarming with larvæ in spite of the presence of fish, evidently of a species which did not fancy a diet of mosquitoes. I may as well make it clear while speaking of the reservoirs and filter-beds, that the presence of mosquito larvæ in these places is no danger to the City in general but only to the unfortunate people who have to live in the immediate neighbourhood. Both at Mazagon and Malabar Hill the vicinity of the waterworks has long been known to be malarious and this has usually been ascribed to leaking water. Probably this has been one cause, but there is no question that the reservoirs and filters themselves are a source of considerable danger to the areas immediately adjoining them.

Foreshore Pools.

Foreshore pools existing at Colaba and on the west of Nepean Sea Road at Malabar Hill are also a source of danger owing to the breeding of *Nyssorhynchus stephensi.* There are two places in Colaba, one on the east and one on the west coast, where I have found this mosquito breeding. One of these places is a small Bay just to the south of Sassoon Dock, and the other is a little Bay just at the back of the Colaba Post Office. In addition to these places it may be mentioned that *Culex* mosquitoes and *Myzomia rossi* can be found breeding all along the foreshore of Upper Colaba, but so far *N. stephensi* appears to be absent—probably because no permanent breeding places for the insect exist there, all the wells and cisterns being carefully covered. Along the foreshore of Nepean Sea Road there are a great number of rocky pools which usually

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contain a mixture of fresh and sea water. Very many of these contain larvæ of *N. stephensi* during the monsoon when there is an extra amount of fresh water there.

Fresh water is not absolutely essential to mosquitoes, and it is probably the motion of the waves rather than the salt water which keeps many parts of the sea coast free of mosquito larvæ. Mosquitoes do not hesitate to lay their eggs upon sea water, and the larvæ will hatch out and live in it; but larvæ, which have hatched out in fresh water, usually die when placed in a mixture containing 66 or 75 per cent. of sea water. Not long since I received from Colaba a sample of living mosquito larvæ taken from a shore pool. I estimated the amount of salt present in the water and found it 25 per cent. more than in ordinary sea water.

You will see from what I have been telling you that the distribution of *N. stephensi* is very wide, but is not by any means uniform, as may be shown by the fact that, over three hundred breeding places of this mosquito have been found in the North Fort Section and only two in Khara Talao. The existence of suitable breeding places has a great deal to do with this variation, but does not entirely determine it. It has been noticed that where favourable breeding places occur in close proximity to one another a larger proportion is infected than is the case where potential breeding places are more widely separated.

Originally, *N. stephensi* must have been largely restricted to breeding in wells, tanks and fountains, but the introduction of a pipe-water supply, on the intermittent system, and the adoption of the water-carriage system of sewage disposal, has led to the erection in every part of the city of large numbers of cisterns many of which serve as breeding places of mosquitoes. The negligence which has allowed the use of open and improperly closed cisterns is largely responsible for the wider distribution of dangerous anopheles.

Certain factors also appear to influence the distribution of *Nyssorhynchus stephensi*, tending on the one hand to favour its spread, and on the other to restrict it, and limit its numbers.

Among influences which tend to widen the distribution of this and other species of mosquitoes, vehicles appear to play a considerable part. During the monsoon a hundred vehicles, including

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victorias, shigrams and broughams, were examined, in different stables in the city. In the course of this examination it was found that mosquitoes were invariably present in these vehicles, unless they had been recently disturbed. The greatest number of mosquitoes counted in one vehicle was 25. The greatest number of *N. stephensi* was 13. Watching the behaviour of mosquitoes occupying a vehicle that was being taken out from the stable, it was found that most of them remained clinging to the hood or inside the carriage until it had gone some distance; but gradually they became disturbed by the movements of the vehicle, and one by one escaped and flew away during the course of the drive.

These observations show the part played by covered vehicles in the diffusion of mosquitoes from one locality to another, and indicate one method by which *N. stephensi* tends to invade fresh areas, reaching by artificial means, places to which it would not ordinarily be carried, either by the wind or its unaided powers of flight.

Among factors which tend to limit the number and restrict the distribution of *N. stephensi* in Bombay, one of the most interesting and important is the existence of another mosquito belonging to the *Culicine* group. This mosquito, *Culex concolor*, appears to exert a directly antagonistic influence upon other mosquitoes, anopheles in particular, because its larvæ are specially adapted for preying upon those of other mosquitoes. It is frequently found breeding in the collections of water haunted by *N. stephensi* and destroys great numbers as the following observations show.

Four large larvæ of *Culex concolor* were placed in a bowl containing a number of larvæ of *N. stephensi* of different sizes. These they immediately began to seize and devour and in the course of two hours they had destroyed over 50. They will act in a similar manner under natural conditions as is shown by the fact that, breeding places which early in the season contained large numbers of larvæ of *N. stephensi*, later in the year contained larvæ of *Culex concolor* also; and subsequent examination has shown that *Culex concolor* alone remained.

The larvæ of *Culex concolor* does not seek its prey, but waits for its approach. It usually assumes an almost horizontal position just below the surface of the water, admirably suited for attack

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upon larvæ of anopheles, which float on the surface. Occasionally it may be seen to turn its body in a half circle, when any moving object comes near it, evidently keeping a sharp look-out for the approach of its prey. It is exceedingly voracious and when hungry will seize any larva that ventures without striking distance, the movements of its head and neck being so rapid that the eye cannot follow them. Small larvae are swallowed whole, disappearing instantaneously; large larvæ are seized and held remorselessly in spite of their struggles, and are rapidly devoured while still alive.

In Bombay and possibly in other places *Culex concolor* plays a definite role in reducing the number of anophelines and is possibly one of the factors which assist in producing fluctuations in malaria from year to year. A number of aquatic insects and aquatic larvæ are known to prey upon mosquito larvæ. Among these may be mentioned dragon-fly larvæ, ephemera larvæ, the larvæ of chironomus and corethra, water boatmen and certain among the water-beetles. All these may be found breeding in Bombay in pools and tanks and wells. In addition I have recently discovered a minute almost microscopic water-bug which attacks and kills large numbers of anopheles larvæ. This little bug, which is only about 1-40th of an inch long, is present in considerable numbers in some of the wells in the north of the island. It is black in colour and runs readily about on the top of the water. It possesses a long suctorial proboscis tucked away on the underside of its body. Quite recently I was breeding out a number of anopheles mosquitoes from larvæ and was rather disappointed to find that all the larvæ were dying. On careful examination of the jar in which they had been placed I noticed two or three minute black bugs running rapidly about on the surface of the water. Out of curiosity I placed one in a small tube with some anopheles larvæ and very soon I saw the bug gently approach the larva at its tail end and then gradually move forward to the thorax. The larva did not appear to notice anything but by watching carefully with a magnifying glass it could be seen that the bug had inserted its proboscis into the thorax of the larva and was busy sucking out its juices. I placed one small bug in a bottle with a dozen anopheles larvæ and in twenty-four hours all but two were dead.

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Tadpoles and frogs do not appear to be of the least value in keeping a place free from mosquito larvæ, and the latter are distinctly harmful, as they prey upon small fish which might otherwise serve this purpose. Turtle are useless for destroying mosquito larvæ and gold fish are not always efficient, numerous anopheles larvæ often being found in the same tank or fountain with them. A small fish, known locally as "Piku" is far more useful; but it must be present in sufficient numbers, and its efforts must not be hampered by floating weed or rubbish.

During the past few months this fish has been introduced experimentally into 15 wells which contained large numbers of larvæ of *N. stephensi*. All but two wells were rapidly cleared of mosquito larvæ and in the latter they had been reduced in number, but the presence of floating matter, leaves and flowers, afforded a safe cover for a few mosquito larvæ which thus escaped destruction.

The "Piku" fish which has been identified for me by Mr. Kinnear as *Haplochilus lineatus* were first, I believe, experimented with by the late Mr. E. H. Aitken who called them "Scooties" because of the way in which they darted about in the water. They are quite small fish rarely reaching 3 inches in length. When young they possess a brilliant white spot on the top of their heads just between the eyes. This spot is less noticeable in the older fish which become more striped about the body. Captain Liston showed me these fish when first I came to Bombay. They can be caught in considerable numbers in the stream which flows from the Vehar Reservoir past Marol and Kurla.

Since experimenting with "Piku" fish or "Scooties" I have come across two other species of fish which destroy mosquito larvæ. One of these fish can be obtained from ponds and tanks at Thana and is known locally as "Kazari" or "Kasara." Mr. Kinnear has indentified it for me as *Anabas scandens*.

The specimens of the fish which I have seen have been small, varying in size from 2½ to 6 inches, but I am told that it often reaches a length of 12 inches or more. Some of the fish are blackish in colour but many of them have a reddish tint on the back above the gills. They are rather thick-set in shape with big heads and

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beautiful eyes which are large and bright yellow in colour. The "Kazari" is a most active fish and very voracious, destroying hundreds of mosquito larvæ in a very short time. It appears to be a surface feeder and quickly swallows anopheles larvæ and pupæ, and I have seen it jump several inches out of the water after a flying adult insect. Altogether the "Kazari" appears to be a most excellent fish to place in wells, in tanks and to keep in ornamental fountains. The third fish which Mr. Kinnear tells me is *Polyacanthus cupanus* was caught in the Gowalia tank. It is quite small, about 1½ to 2½ inches in length, with crimson underfins and a peculiar whisp on its tail. It is not a very quick feeder and has only a small mouth. It appears to eat mosquito pupæ readily but not nearly so quickly as the Kazari fish. The Chilwa *(Chilwa argentia)* which has sometimes been recommended for mosquito destruction does not appear to be nearly as efficient as either of the three fish I have just described. It is not a surface feeder and will leave anopheles larvæ untouched for long periods. The mud fish common in tanks and bheels do not appear to feed readily upon mosquito larvæ. I obtained two species of fish of this kind from the Gowalia tank but they would not eat either larvæ or pupæ. I do not know the names of these fish but in Assam similar fish are called "Singa" and "Mangur" respectively. "Jingas" or fresh-water prawns (called "Chingri" in Assam) will not touch mosquito larvæ.

The presence of water-weed in a tank, well or cistern is often a source of danger, forming as it does an excellent shelter for mosquito larvæ. Some water plants, notably duck-weed or *Lemna* and *Azolla* have been suggested as being useful in preventing the breeding of mosquitoes. These suggestions do not appear to have been based upon careful observation and experiment. In my experience these plants are of little or no value in preventing the presence of mosquito larvæ. But there is a weed which I have met with in Bombay and elsewhere which under certain circumstances appears to be a useful preventive of mosquito larvæ. This plant is the rootless duck-weed or *Wolffia arhiza*. It takes the form of small bright green round grains without stem, roots or leaves. These grains float on the surface of the water just like a scum of

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bright green seeds. Where it is growing in large amount so as to form a continuous layer on the top of the water no mosquito larvæ can live and pools and tanks covered in this way will be found quite free of larvæ. Anopheles larvæ placed in a bowl of water covered with a layer of *Wolffia arhiza* immediately assume an almost vertical position, hanging head downwards in a manner quite unnatural to them. After a short interval they sink to the bottom dead. The larger the larvæ the more quickly they die, as young larvæ can pass their tails between the plant grains and so get access to the air. Culex larvæ and Stegomyia larvæ are also destroyed, but the latter live for several hours in the weed-covered water. Where the continuity of the layer of *Wolffia arhiza* is broken by the presence of grass or reeds or large leaved weeds, mosquito larvæ are enabled to exist without difficulty, and it would appear therefore that before this plant could be used with success as a protection for tanks, the latter would have to be cleared of other growths. The round tank at the Mint which is usually covered with a good growth of *Wolffia arhiza* is free of mosquito larvæ, and so is the Nakhoda tank and several pools near Parel.

In this paper I have endeavoured to deal with certain points in the Natural History of Bombay Malaria which I hope may prove of interest. I have said very little about malaria as it affects the population of Bombay, but I may mention before concluding that the infection may be found in every part of the city and island and that in certain areas it is so prevalent that over fifty per cent. of the population harbour one or other form of the parasite.

In the north of the island and round about the Flats and low-lying parts malaria is uncommon, contrary to what people have believed for many years; but in the older parts of the city, especially where there are many wells, malaria is present to an extraordinary extent. The New Dock Works have been responsible for an increase in malaria in the Frere Road area, but not so much on account of the excavation work there as because numerous pools have formed on the land around the excavations. But the New Docks did not bring malaria to Bombay, and there is evidence that it has been present in many localities for a very long time; and had there been no mosquito infected wells, cisterns and tanks in

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the neighbourhood of Frere Road it is doubtful if we should have heard of much malaria in association with the New Docks. When the Prince's and Victoria Docks were under construction there does not appear to have been any marked occurrence of malaria in their neighbourhood, neither does there appear to have been any great increase along the line of the new Port Trust Railway, although a considerable amount of excavation work went on there. At Sewri too there is hardly any malaria even close to the new reclamation. All these facts bear out the contention that temporary pools of water only become dangerous when permanent breeding places of malaria carrying mosquitoes exist in their vicinity and the problem of malaria prevention for Bombay becomes chiefly a question of dealing with the permanent breeding places of *N. stephensi*. This can only be attained by controlling all permanent collections of water and rendering them mosquito proof, either by protecting them with some sort of cover or stocking them with large numbers of one or other of the species of fish that I have mentioned in this paper. Unfortunately we cannot depend upon this sort of thing being carried out by voluntary effort and it rests with the members of this Society in consort with all loyal citizens, who have the welfare of Bombay at heart, to do their best in urging upon the authorities the necessity for adopting a rational system of malaria prevention for the City and ensuring by proper bye-laws the necessary powers for putting it into operation.

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Explanation of Plate I.

No. 1. Head of Male Anopheles showing proboscis, spatulate palpi and plumose antennæ. The banding of the palpi in the male anopheles is not characteristic and affords no help to recognition of the species.

Nos. 2-6. Heads and Appendages of Female Anopheles showing characteristic banding of palpi.

No. 2. *M. rossi.*

No. 3. *N. stephensi.*

No. 4. *M. barbirostris.*

No. 5. *N. jamesi.*

No. 6. *M. culicifacies.*

No. 7. Hind leg of *M. rossi* showing white bands at the joints.

No. 8. ,, ,, ,, *N. stephensi* showing speckling.

No. 9. ,, ,, ,, *M. barbirostris* unbanded almost completely black.

No. 10. ,, ,, ,, *N. jamesi* showing the white tips and the speckling.

No. 11. ,, ,, ,, *M. culicifacies* unbanded black or dark brown.

Explanation of Plate II.

Key to larvæ of Bombay Anopheles.

(1) Diagram of Anopheles larva showing frontal hairs *F. H.*, which must not be confused with feeding brushes *F. B.*, also palmate hairs or fans *P. H.* a pair of which is usually present on most of the abdominal segments.

(2) Complete palmate hair or fan from larva of *M. rossi.*

(3) Single leaflet from palmate hair or fan of *M. rossi.*

(4) ,, ,, ,, ,, ,, ,, ,, ,, *N. stephensi.*

(5) ,, ,, ,, ,, ,, ,, ,, ,, *M. barbirostris.*

(6) ,, ,, ,, ,, ,, ,, ,, ,, *N. jamesi.*

Note.—The palmate hairs on *N. jamesi* are very large and distinct, much more so than those on *M. rossi*, *N. stephensi* and *M. barbirostris.*

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(7) Single leaflet of palmate hair or fan of *M. culicifacies.*

Note.—The palmate hair on *M. culicifacies* are very large and prominent like those of *N. jamesi.*

(8) Frontal or clypeal hairs of larva of *M. rossi.*

(9) ,, ,, ,, ,, ,, ,, ,, *N. stephensi.*

(10) ,, ,, ,, ,, ,, ,, ,, *M. barbirostris.*

(11) ,, ,, ,, ,, ,, ,, ,, *N. jamesi.*

(12) ,, ,, ,, ,, ,, ,, ,, *M. culicifacies.*

(13) Special branched hair on inner side of antennæ of *M. barbirostris.*

Note.—It is only possible to see the branching of the frontial hairs of *N. stephensi* and *M. culicifacies* by very careful focussing with 1/6th inch objective.

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ADDITIONS AND CORRECTIONS TO CERTAIN LOCAL BUTTERFLY LISTS, WITH THE DESCRIPTION OF A NEW SPECIES.

BY

CAPT. W. H. EVANS, R. E.

The following additions and corrections to certain local lists of butterflies that have appeared from time to time in the Society's Journal may prove of interest. The additions are in nearly every instance the result of personal experience; in the corrections generic names have not been altered in cases where the specific name is correct.

"THE BUTTERFLIES OF CHITRAL." Vol. XIV., p. 666.

12. *Kanetisa sp.*—Is only a casual variation of the preceding species *Karanasa digna.*

15. *Karanasa cadesia.*—Has been placed as a synonym of the preceding species *Karanasa huebneri.* I am convinced that there are two closely allied though distinct species occurring together in Chitral though Col. Bingham to whom I sent a series did not agree. Mr. Doncaster, of Watkins and Doncaster, classed the specimens as all *leechi*, Moore, also placed as a synonym of *huebneri* by Bingham.

26. *Paralasa kalinda* = female of No. 25 *shallada.*

27. *Paralasa sp.* = *Erebia mani.*

29. *Melitæa robertsi* = *Melitæa didyma persea.*

30. *Melitæa persea* = *Melitæa didyma chitralensis*, an insect which is, I think, entitled to specific rank.

31. *Melitæa sp.*—Is probably a casual variety of No. 29: the specimen is now in the British Museum.

32. *Melitæa sp.* = *Melitæa saxatilis shandura*, Christoph.: this was identified by Bingham who intended to mention it in an appendix to his vol. 3.

55a. *Vanessa egea interposita:* This is the insect mentioned under No 55 as common in the spring.

56. *Libythea lepita* = *Libythea celtis.*

57. *Lycæna medon* = *Lycæna astrarche.*

58. *Lycæna sp.* = *Lycæna eumedon antiqua*, Staudinger.

59. *Lycæna sp.* is an aberrant female of No. 58.

61. *Lycæna sp.* = *Lycæna cytis*, Lang: not in Bingham.

62. *Lycæna persica* = *Lycæna icarus.*

63. *Lycæna ariama* = *Lycæna stoliczkana.*

65. *Lycæna sp.* = *Lycæna sarta:* the orange bordered females mentioned under No. 64 belong to this species.

66. *Lycæna sp.* = *Lycæna devanica.*

67. *Lycæna sp.* = *Lycæna pheretes lehana.*

68. *Lycæna metallica* = *Lycæna omphisa.*

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72. *Lycæna sp.* = *Lycæna sebrus*, Boisduval: not in Bingham.

103. *Colias sp.* = *Colias alpherakii.*

104. *Colias sp.* = *Colias wiskotti.*

105a. *Gonepteryx rhamni chitralensis:* I did not recognise this until Bingham's book was published and then found that I had a solitary male amongst my specimens of *rhamni.*

110. *Pieris sp.* = *Pieris rapæ* as No. 108.

112 and 113. *Aporia sps.* = *Aporia nabellica.*

115a. *Pieris glauconome*: I found a male of this species amongst my specimens of *daplidice.*

123. *Parnassius stoliczanus* = *Parnassius delphius hunza.*

128. *Hesperia staudingeri* = *Carcharodus altheæ.*

129. and 130. *Hesperia sps.* = *Arnetta lesliei*, Elwes: named after Major Leslie, joint author of the original paper.

138. *Parnassius sp.* = *Parnassius hardwickei.*

139. *Hesperia sp.* = *Actinor radians.*

"THE BUTTERFLIES OF LUCKNOW." Vol. XIV., p., 481 and XVI., p. 720.

89a. *Telicota augias*, found rarely with the very common *Telicota bambusæ* in the Dilkusha Gardens, September 1902.

96. *Parnara kumara.*—Is not this *colaca* or possibly *bevani*, which would be much more likely to occur in Lucknow than *kumara.*

"THE BUTTERFLIES OF MUSSOORIE." Vol. XI., p. 205.

214a. *Listeria dudgeoni*, De Nicèville: one specimen obtained in the Brewery Nallah in April 1906 and identified by Bingham: the only previous record is, I believe, the type from Bhutan.

277a. *Sarangesa sp*, caught at the Kimpti Falls in April 1906: the specimen was sent to Col. Bingham who intended to describe it as a new species in his vol. 3.

These two butterflies are now in Mr. Philip Mackinnon's fine collection of the Mussoorie butterflies.

"THE BUTTERFLIES OF THE CENTRAL PROVINCES." Vol. V., p. 19.

8a. *Mycalesis visala*: several specimens of the dry season form were caught by Major Stokes Roberts, R. E., in Pachmarhi in November 1905.

8*b*. *Mycalesis perseoides*: I caught several specimens of this insect in Pachmarhi in October 1906 and had put them amongst *mineus* until quite recently: there is no mistaking the small light coloured brand.

9. *Mycalesis malsara* = *Mycalesis malsara lepcha.*

14. *Ypthima singala.*—In vol I., p. 231 of Marshall and De Nicèville's "Butterflies of India, etc." mention is made of a typical pair of *singala* obtained by Mr. Betham near Nagpur; I caught a typical male in September 1905 at Jabalpur: there are also several other records of *singala* from various parts of India. Bingham confines *singala* to Ceylon and gives it a

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male mark: he records *striata* from the Nilgiris, which has nothing to do with the insect under consideration as it has the ocellus on the forewing above prominent apart from other differences. I think that *singala* may be taken as occurring in various parts of India: it differs from *avanta* in the absence of a male mark, usually only one ocellus on the hindwing above, indistinct bands on the forewing below, which are even in width and parallel to one another, and the obsolescence of the apical ocellus of the hindwing below.

16. *Ypthima philomela* = *baldus*: I do not think that *philomela* occurs in the C. P. *Baldus* is very common round Pachmarhi and specimens from there do not differ from specimens I have from Sikkim and the Palnis.

17. *Ypthima ariaspa* = *inica* included as No. 15.

May I venture to criticise Mr. Bell's treatment of the Ypthimas in the admirable series of articles on the *Common Butterflies of the Plains* now appearing in the Society's Journal. The species described are *philomela*, *asterope*, *hubneri* and *ceylonica*: but why should not *baldus* and *inica* have a place, especially as the highly localised *Melanitis bethami* has been accorded one? As regards *philomela*, Mr. Bell has taken word for word Bingham description and localities and has added "Y. *baldus* is given as a species extending from the Himalayas to Bengal, Central, Western and Southern India: Assam to Tenasserim. It is said to differ from Philomela in having the striæ coarser on the underside." Now Mr. Bell's figure of "*philomela*" shows an insect with distinct subbasal and discal bands on the underside, but there is no mention of these important features in his description: the figure is in fact what Bingham calls *baldus*. Of course until recently Bingham's *baldus* was known as *philomela* and Bingham's *philomela* as *tabebla*: the nomenclature of these two insects seemed however to have been finally cleared up by Watson in the Society's Journal Vol. X., p. 218. Can it be that Mr. Bell disagrees with Bingham on this point; if so I think this should be made clear and in any case the description and figure ought to agree with one another.

31. *Neptis nandina*.—Capt. Graham in October 1909 obtained some of the *yerburii*, *soma* group of *Neptis* in Pachmarhi. I did not have much time to examine them but noted that the markings were unsullied and the bands of the hindwing of even width: this being so they should be *soma hampsonii*.

59a. *Azanus ubaldus*.—Common at Jabalpur in the autumn and cold weather: the local form seems to be on its way to *Uranus*.

61a. *Nacduba hampsoni*.—I obtained a male in Pachmarhi in October 1906: it agrees well with Bingham's description and Mr. Doncaster confirmed my diagnosis.

88. *Terias æsiope* = *libythea*.

89. *Terias rubella* = *venata*.

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92. *Catopsilia catilla* = No. 93 *C. crocale* of which it is a dimorph.

95. *Catopsilia gnoma* = *C. florella*, which I have found common at Jabalpur.

98. *Catophaga paulina* = *Appias albina*.

98a. *Appias libythea*.—Col. Jermyn obtained a female in Saugor in the autumn of 1907.

99. *Nepheronia gæa* = *Pareronia hippia*.

105. *Callosume sp.* = Dry season form of No. 104 *Colotis danaë*.

106. *Callosume sp.* = *Colotis etrida*.

107. *Callosume sp.* = *Colotis vestalis*.

107a. *Colotis amata*. Recorded by Mr. Witt from Hoshangabad.

110. *Papilio dissimillis* and 111. *Papilio papone* = *P. clytia*.

112. *Papilio erithonius* = *P. demoleus*.

123a. *Parnara sinensis*.—Occurs during and after the rains rather rarely at Jabalpur. Mr. Betham did not number the Hesperiidæ. I have carried on the numbers for convenience.

125. *Parnara bevani* and 125a *Parnara colaca*.—A small skipper is very common in Jabalpur after the rains and, as I identify it, it is *P. colaca*; Col. Bingham to whom I sent a long series called it *bevani*, but I think he was wrong and I have not met with true *bevani* in the C. P. though it is not at all unlikely to occur. There are four small variable skippers very much alike, *viz.*, female *mathias*, *guttatus*, *colaca* and *bevani*: they have given me a good deal of trouble and perhaps a few notes on them may be useful to other collectors. Female *mathias* has on the forewing above always two spots in the cell and a spot in 1a, while the spot in 2 has its lower edge outwardly pointed; the hindwing above is usually devoid of spots but occasionally has as many as three; the hindwing below has a small spot at the end of the cell and a curved discal series of four to seven small spots. *Guttatus* usually has no spots in the cell of the forewing, though sometimes there are two, never a spot in 1a and the spot in 2 is quadrate; on both sides of the hindwing there is normally a straight decreasing row of 4 spots pointing to the apex of the wing in interspaces 2 to 5, sometimes the spot in 2 or 5 is out of line and there may be a spot at the end of the cell or one in 6. *Colaca* as regards the forewing resembles *mathias* except that there may be one or no spots in the cell; the hindwing above has nearly always a small prominent white spot in 4 but there may be two or none: the hindwing below has usually three largish spots in 2, 3 and 5 with occasionally a spot in 6, the row is curved, running parallel to the costa. *Bevani* is a smaller insect and differs from the others in having the termen evenly rounded instead of excavated just above the tornus: the forewing has all the spots reduced in size, usually one spot in the cell rarely a small spot in 1a, the spot in 2 is quadrate and there is often a spot in 6: the hindwing above is usually spotless but there may be as many as

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three faint spots: on the hindwing below the spots are much as in *colaca* though smaller and there is often a spot in 1. The only other skipper that might be confused with the above is female *subochracea*, which I have never seen; the *kumara* and *conjuncta* groups run much larger over 1½ inches instead of about 1¼ inches.

127a. *Suastus robsonii.*—One specimen caught at Jabalpur in March 1906: it agrees well with De Nicéville's description, but I am not sure that *robsonii* will not eventually turn out to be merely a casual aberration of *gremius*.

128a. *Sarangesa dasahara.*—Common after the rains in Pachmarhi and I am surprised that Mr. Betham overlooked it.

I should like to take this opportunity to describe what I think is a new *Nacaduba* from Sikkim.

Nacaduba sivoka n. sp. In May 1906 I caught 3 specimens of a *Nacaduba* in some jungle at Sivoke in the Teesta Valley, Sikkim. They are allied to but distinct from *ardates*. Two are brown above with a few blue scales scattered on the disc: the third is brown with a large iridescent blue white patch on the disc of the forewing and some ill defined white patches on the hindwing, the discocellulars are defined with black on the forewing. Underneath the ground colour is pale golden yellow with light brown markings and fasciæ arranged as in *ardates* except that the basal fascia on the forewing does not extend to vein 1: the apical spot of the submarginal series on the hindwing is much enlarged being as large as the usual pre-anal spot. The termen of the forewing is very convex, much more so than in either sex of *ardates*: but for this last feature it seems to very closely resemble *N. noreia*. It seems to be very close indeed to what De Nicéville talks of as *N. lutea* in the Society's Journal Vol. X, p. 36. I could have obtained many more of the insect, but it never struck me at the time that it was anything unusual.

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A PRELIMINARY LIST OF THE FISHES OF TIRHOOT, BENGAL.

BY

GORDON DALGLIESH.

Owing to the kindness of Mr. F. K. Rawlins, I have received a small collection of some 30 odd species of the commoner fishes of Tirhoot, Bengal. Like most of the Indian rivers, tanks, and jheels, Tirhoot abounds with a varied fish fauna which play no small part in the economy of the poorer native population, all fishes with a very few exceptions being extensively used as food. Netting to a large extent is carried on, while for the capture of very small species a form of wicker basket is employed, acting on the same principle as the lobster traps and eel baskets of home fishermen. Very large fish are killed by means of a form of spear made of bamboo and tipped with steel. Perhaps the commonest fishes occurring in the rivers are the *Siluridæ*, which on account of their forbidding and very often, loathsome appearance, are not relished as food by Europeans—though some are very fair eating—but are esteemed by most of the natives, especially the very poor classes. It is remarkable how many of the *Clupeidæ* (Herrings) and others, as a rule, essentially marine and esturine fishes find their way so far inland; for more than one species of herring is quite common in Tirhoot. In spite of the voluminous literature that has been written on Fishes in India, Day and other great ichthyologists have given us very little information regarding the life history of any species. The books on Indian fishes are purely of a technical character and really only of service to the systematic naturalist. On looking through those splendid volumes *Fishes of India* and "Fishes" in the *Fauna of British India* series one cannot but feel regret for the paucity of information on habits, etc. And the reason for this is not hard to discover. Most of us in India are too busy to pay much attention to the habits of the creatures around us, and nearly all our spare time is taken up in collecting the different objects we are specially interested in. Indeed, for this alone we have to depend largely on native collectors. And, again, climate and weather greatly retard those that would wish to study the life histories of the varied Indian fauna. Fishes and other lower vertebrates are extremely difficult nigh almost impossible to study in a state of nature. Much might be done and really valuable information gained by the erection of Biological stations for both Marine and fresh-water fauna in special charge of a trained scientific staff. But as things are now we must necessarily remain in ignorance regarding the ways of even our commonest fishes. It is true a lot *can* and *has* been learnt by keeping fishes in those heterogeneous receptacles designated "aquariums," and I would urge those sufficiently interested in fishes, to erect one for himself, however rough, and by dint of much careful labour and patience to learn as much as

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possible the habits of the inmates, he may keep from time to time, noting down carefully anything and everything that he sees. Nor must the information gleaned from native sources be regarded lightly. Many natives are keen observers, and do not always wilfully mislead with an idea to please, and it does not do to scoff at what might at first hearing appear to be a "fairy tale." The true naturalist will always make notes of what he obtains by hearsay, endeavouring as far as possible to ascertain the truth for himself. For, however improbable a story might at first seem, it should be borne in mind that "there are more things in heaven or earth than are even dreamt of in man's philosophy." For instance, most of us in India know for a fact that, after a shower of rain many hitherto dry ditches and hollows are alive with small fish. Where do these come from? Are they carried in a vertex by the rain and deposited there? Highly improbable. Or have the fishes until now been hibernating in the mud? More than probable (see note under *Ophiocephalus*).

For the naming of most of the fishes listed here, I am indebted to Mr. Boulenger of the British Museum to whom my best thanks are due for much kindly help and information that he has always ungrudgingly at all times given to me. The nomenclature and numbers here employed are those of "Fishes" in the *Fauna of British India* Series.

The list contains two rare fishes and one, herring, hitherto only recorded from the coast.

Siluridæ.

The *Siluridæ* or "cat fishes" are largely represented in India and fresh waters of other temperate and tropical regions, a few being found in salt waters. They all have carnivorous tendencies, some species being said to feed on carrion. In general appearance they are unattractive, a few having a most forbidding appearance. Their bodies have no scales, but in many genera there are long scutes.

Sometimes a stout long spine is present in front of the dorsal and pectoral fins, which are said to be poisonous. One to six pairs of barbels embrace the mouth very long and string-like in many species. It is from these barbels the group derive their popular name. These appendages having a fanciful resemblance to cat's "whiskers." Some *siluroids* have an accessory breathing organ which enable them to live out of water for a long time.

135. *Eutropiichthys vacha.*

Day gives the range of this fish from the Punjab and all large rivers of Sind, Bengal and Orissa. It is largely eaten by the natives of Behar.

143. *Ailia coila.*

Throughout the Bengal plains in large rivers and Assam. Greatly esteemed as a food fish.

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151. *Pseudeutropius garua.*

India generally.

156. *Macrones aor.*

Common throughout India, and is said to attain a length of 6 feet. In appearance it is perhaps one of the most repulsive looking of all the *siluroids.*

163. *Macrones cavasius.*

211. *Glyptosternum botium.*

Day records this fish from Delhi and the Northern rivers of Bengal. It never grows to any great size, and Mr. Boulenger informs me is rare. I have received one specimen which is now in the British Museum.

222. *Gagata cenia.*

Four specimens collected which were all quite small and are of the yellowish bronze colour with dark bands over the head and back as described by Day.

228. *Nangra viridescens.*

Four specimens obtained, Mr. Boulenger says it is a rare species.

Family *Cyprinidæ.*

The carps are well represented in the waters of Tirhoot and Bengal in general, many being especially valuable as food. Few members of this family are foul feeders and are said to prefer clean to dirty water. In their diet they are for the greater part herbivorous. It is noteworthy that though *Cyprinidæ* abound in the fresh waters of the old world and North America, they are but purely represented in Africa and are absent altogether from S. America and Australia. It is stated that natural hybrids occur among certain members of this family.

237. *Lepidocephalichthys guntea.*

Two specimens of this loach were obtained quite small ones, and according to Day it has a wide range in India evidently ascending the mountain streams to as high as Darjeeling. In their habits loaches are sluggish fish, and are not esteemed much as food except among the native population. They never attain any great size.

300. *Labeokontius.*

Hitherto this fish has not been recorded from Bengal. Day gives its range from the "base of the Nilgiris, and the Cauvery and Coleroon in all their branches down to the coast. Grows to two feet in length." Therefore, Tirhoot must stand as a new locality for this fish. I have received two specimens which were identified for me by Mr. Boulenger.

321. *Cirrhina mrigala.*

Several quite small examples. Attains 18 pounds in weight (Day).

322. *Cirrhina latia.*

In contrast to the last on the authority of Day this species is said to attain only 8 inches in length.

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323. *Cirrhina reba.*

Several quite small examples. The intestines of this species are very dark, often showing through the somewhat pale skin.

341. *Barbus sarana.*

Probably ranges throughout India. Many species of barbels attaining a large size are frequently taken in the jheels and tanks of Behar, being a favourite food fish among Europeans and natives alike. One species which I have never yet been able to satisfactorily determine is known as the "*Rhoho,*" and judging from some large bony capsules of the head of this fish, which I have in my possession, must attain an enormous size.

389. *Barbus conchonius.*

Recorded from Behar by Day, and attaining probably no great size.

413. *Aspidoparia morar.*

A small fish not exceeding much more than seven inches in length.

417. *Rohtee cotio.*

In general appearance this fish has a great resemblance to the Bream (*Abramis brama*) of home waters.

436. *Danio devario.*

An exceedingly beautiful little fish which glistens in life with all the colours of the rainbow. I recollect obtaining many examples which I kept alive for some time taken from one of the large jheels in the district. Day says it attains a length of four inches.

449. *Chela gora.*

This fish is excellent eating and is the "white-bait" of Behar residents. To the natives it is known as *chulwa* in the Darbhanga district. It affords good sport with a light rod taking a small fly. I have killed several on a hook baited with a fragment of red wool. In general appearance it closely resembles the well-known "sprat," and in the evenings becomes very lively, and may be observed jumping no little distance out of the water. I think it is to a certain extent migratory, as in some seasons I could not obtain any. It is more common in the cold than in the hot weather, and as far as my own observations go, is essentially a river fish. It attains a length of 9 inches.

Clupeidæ.

The family of herrings are for the greater part marine and esturine fishes, few being found in fresh-water. It is superfluous here to say anything regarding their importance as a food supply. Though the majority are good eating, a few tropical species are said to be poisonous. The family is widely spread in temperate and tropical zones being well represented in India.

469. *Clupea chapra.*

Throughout the fresh waters of India in tanks and rivers. It is common in Tirhoot, and attains a length of 8 inches.

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476. *Pellona elongata.*

It seems very little short of remarkable that this fish should have been obtained so far inland as Tirhoot. Day gives its range as "*Seas of India* (the italics are mine) to the Malay Archipelago, China and Japan." My specimens were identified by Mr. Boulenger. Herring's being chiefly migratory fishes, no doubt, at times travel great distances.

498. *Engraulis telara.*—Probably throughout Bengal.

501. *Engraulis purava.* One specimen received. Day records this species from "seas and estuaries of Sind and both sides of India, also the Malay Archipelago."

Notopteridæ.

The fishes of this family are essentially tropical, being found in fresh or brackish water. The scales are thin and cycloid extending over the head and gill covers. The pelvic fins are absent or reduced. Two species are Indian.

519.—*Notopterus kapirat.*—Two examples obtained.

Scombresocidæ.

The gar fishes are remarkable in having the jaws prolonged into a beak. They are for the greater part marine, a few being found in fresh waters.

536. *Belone cancila.*—This fish is, I think, fairly common in the rivers and I used to have several examples brought to me. It is said to attain a length of 12 inches or more.

Percidæ.

The large family of Perches is found in fresh and salt water alike. They are chiefly gregarious sometimes swimming in vast shoals, but are said when they grow old to lead a solitary existence. The famous Nair or "cock-up" (*Lates calcarifer*) may be cited as a familiar Indian example of this family. This fish has attained a weight of 200 pounds (Day).

628. *Ambassis nama.*—I received several specimens of this little perch.

827. *Nandus marmoratus.*—I received two specimens of this handsome little fish. Day says it is common in ditches and inundated fields where it preys on small *Cyprinidæ.*

868. *Sciæna coitor* (?).—I have marked this species with a query as I only have one immature example. Mr. Boulenger marked it "*Sciaena sp?*" but I think it more than probable it can be referred to as *S. coitor.*

Gobiidæ.

The family of gobies is a small division of the suborder *Acanthopterygii* including the single family *Gobiidæ,* which though numerous, are fishes of small size, but interesting to the student on account of their strange breeding habits. The female fixes her eggs to the underside of stones, weeds, or shells, very often making a kind of nest. The male is more

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brightly coloured than the female, and watches over the eggs until they are hatched remaining fixed to a stone or shell by means of a pelvic sucker. They are usually found in shallow water, fresh, brackish or salt. The Indian species constitute a large family.

1051. *Gobius giuris.*—I received two specimens of this little fish, which on first sight so closely resembled a familiar English species that I had my doubts at first as to its being Indian, and though I had taken every case to avoid the Indian consignment being mixed up with some British fish I had, I thought I must have done so, until Mr. Boulenger identified it for me as the above species.

Rhynchobdellidæ.

The curious fishes constituting this family are so eel-like in general appearance that they have been referred to as belonging to that family by some naturalists. On closer inspection, however, they differ widely from the eels in many important respects. The important distinguishing feature are the long dorsal fins, the anterior portion of which consists of free spines, and the fleshy snout which is transversely striated beneath in *Rhynchobdella* and not striated in *Mastacembelus*. They are found in fresh and brackish waters of India, Ceylon and Burma, also Asia Minor and West Africa.

1155. *Rhynchobdella aculeata.*

Day says this species is found in brackish waters within tidal influence. My specimens, of course, were taken miles away from any tidal influence. I used to have several brought to me. The fish is said on good authority to drown if unable to reach the upper air. It lies concealed, as a rule, in mud.

Ophiocephalidæ.

The family of "snake-headed" fish are peculiar to the warmer regions of the old world, one species having been successfully introduced from China and naturalised in Western North America. These fishes are said to be able to withstand a severe drought, lying in a torpid condition in the mud until the rain, filling up the hollows where they lie hid, wakes them up to life again. It is these fishes that are often found in wayside puddles which the natives declare are brought down with the rain. To enable the *Ophiocephalidæ* to withstand drought, a hollow cavity is present in the head, an "accessory suprabranchial cavity for aërial respiration." These fishes, too, like the climbing Perch *(Anabas scandens)* can travel over wet ground progressing in a snake-like manner.

1205. *Ophiocephalus gachua.*

1206. *Ophiocephalus punctatus.*

Both these fishes are common in Tirhoot and are very good eating. They are called by the natives *Murrel.*

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Labyrinthici.

The members of this family are freshwater and estuary fishes of Asia and South Africa. The family presents some remarkable Asiatic members, including the famous little "Fighting fish" of Siam *(Betta pugnax)*, the most beautiful little paradise fish *(Polyacanthus opercularis)* of China, and the climbing "perch" *(Anabus scandens)*. This last named fish probably occurs in Tirhoot, but hitherto I have not obtained it. The Gourami *(Osphromenus olfax)*, so much esteemed on account of its delicate flavour and naturalised in many parts of India, is also placed in this family.

1215. *Trichogaster lalius.*

I obtained one specimen of this beautiful little fish with Mr. Rawlin's consignment. It is quite common in Tirhoot, and I had at one time several living examples.

Tetrodon sp ?

I used to obtain many examples of a species of small "balloon fish," which are common in the rivers of Tirhoot but never satisfactorily determined the species. It is known to native fishermen as *Pokchar.*

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DESCRIPTIONS OF INDIAN MICRO-LEPIDOPTERA.

BY

E. MEYRICK, B.A., F.R.S., F.Z.S.

XII.

(*Continued from page* 168 *of this Volume.*)

GELECHIADÆ

Narthecoceros logica, n. sp.

♂. 13-14 mm. Head and thorax ochreous-whitish. Palpi fuscous-whitish, more or less sprinkled with dark fuscous. Antennæ ochreous-whitish, with two blackish bands before apex. Abdomen grey. Forewings elongate, costa gently arched, apex round-pointed, termen hardly sinuate, oblique; fuscous-whitish, sometimes partially and variably sprinkled with dark fuscous; a suffused dark fuscous streak along costa from about ¼ to apex; two small cloudy dark fuscous spots transversely placed at end of cell: cilia ochreous-whitish, variably irrorated with fuscous and dark fuscous, especially about apex. Hindwings grey; cilia ochreous-whitish, more or less tinged or suffused with grey except towards base.

Maskeliya, Ceylon (Pole, Green, Alston); in November and December, four specimens.

Frisilia, Walk.

Head with appressed scales, side-tufts in ♂ more or less projecting over forehead; ocelli present; tongue developed. Antennæ over 1, in ♂ simple, more or less thickened and roughened towards base, basal joint moderate, without pecten. Labial palpi in ♂ with second joint short, with dense projecting tuft of scales beneath, terminal joint wholly clothed with dense rough scales, twisted or bent over so as to form another longer tuft lying above the former; in ♀ recurved with second joint expanded with rough scales above towards apex, beneath with more or less developed projecting tuft of rough scales, terminal joint longer than second, slender, acute. Maxillary palpi very short, filiform, appressed to tongue. Posterior tibiæ clothed with rough hairs above. Forewings in ♂ with subdorsal groove edged with dense scales from base to tornus; 2 and 3 stalked or 3 usually absent in ♂ and seldom in ♀, 4 out of 2 in ♂ and seldom in ♀, 7 to termen, 8 and 9 out of 7 or 8 absent, 11 from middle. Hindwings 1, trapezoidal, termen somewhat sinuate, cilia $\frac{2}{3}$-$\frac{4}{5}$; 3 and 4 stalked, 5 somewhat approximated, 6 and 7 stalked.

This genus supersedes *Macrernis*, Meyr. It is a development of *Lecithocera* from which it is distinguished in both sexes by the tufted palpi, and further in the ♂ by the peculiarly modified terminal joint thereof, and the characteristic subdorsal furrow, which are found in all the species. Walker described

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one species, *nesciatella*, (which I have from Maskeliya and Maturatta, Ceylon), and I have described two others, *heliapta* and *rostrata*; I now add six more, but have various others which require further material for elucidation. The species are rather closely allied and difficult; particular attention should be given to the neuration, the form of termen of forewings, and the character of the second discal stigma.

Frisilia senilis, n. sp.

♂ ♀. 12-13 mm. Head and thorax whitish-ochreous tinged with brownish, sides of crown whitish. Palpi in ♂ pale brownish-ochreous, apex suffused with dark fuscous, in ♀ ochreous-whitish, second joint pale ochreous sprinkled with fuscous except towards apex, anterior edge of terminal joint dark fuscous. Antennæ whitish more or less dotted with fuscous, suffused with ochreous towards base, with dark fuscous præapical band. Abdomen whitish-ochreous more or less tinged with grey. Forewings elongate, rather narrow, costa slightly arched, apex obtuse, termen almost straight, in ♂ somewhat oblique, in ♀ more oblique; 3 absent in both sexes, 2 and 4 in ♂ and sometimes in ♀ stalked, 8 and 9 out of 7; subdorsal groove in ♂ slightly sinuate anteriorly, bent down beneath second discal stigma; whitish-ochreous or pale ochreous, with some scattered dark fuscous specks, dorsal area in ♂ sometimes suffused with deep yellow-ochreous; discal stigmata black, dot-like, second in ♂ forming a somewhat oblique short transverse mark: cilia whitish-ochreous, sometimes suffused towards base with ochreous-yellowish. Hindwings light grey; cilia ochreous-whitish more or less tinged with grey.

N. Coorg, 3,500 feet (Newcome); in June, August and November, five specimens. The bent subdorsal groove of ♂ and absence of vein 3 in ♀ are peculiar characters.

Frisilia strepsiptila, n. sp.

♂ ♀. 18-20 mm. Head and thorax light brownish-ochreous, sides of crown pale ochreous. Palpi pale brownish-ochreous, in ♀ terminal joint whitish-ochreous, with anterior edge dark fuscous. Antennæ whitish-ochreous, with dark fuscous præapical band, in ♂ spotted with fuscous, basal joint clothed above with tuft of dense projecting scales, in ♀ somewhat infuscated towards base. Abdomen pale ochreous. Forewings elongate, posteriorly slightly dilated, costa anteriorly gently arched, apex, obtuse, termen sinuate, little oblique; in ♂ 3 and 4 out of 2, in ♀ 2 and 3 stalked, 4 approximated, 8 absent, 9 out of 7; subdorsal groove in ♂ sinuate downwards on anterior half; brownish-ochreous, thinly sprinkled with dark fuscous specks; costal edge infuscated towards base; discal stigmata dark fuscous, first dot-like, second forming a crescentic dot, whence a rather oblique streak of fuscous or dark fuscous irroration runs towards dorsum; termen somewhat infuscated from apex to near tornus: cilia pale ochreous Hindwings in ♂ with long pencil of whitish-

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ochreous hairs lying along costa from base; whitish-ochreous tinged with fuscous, more infuscated posteriorly; cilia whitish-ochreous tinged with fuscous.

N. Coorg, 3,500 feet (Newcome); in November and December, four specimens. This and the next species differ from the rest in the absence of vein 8 of forewings; the basal tuft of antennæ and costal hair pencil of hindwings in ♂ are special points.

Frisilia homochlora, n. sp.

♀. 22 mm. Head and thorax pale ochreous. Palpi whitish-ochreous, second joint sprinkled with fuscous, anterior edge of terminal joint infuscated. Antennæ whitish-ochreous, very indistinctly spotted with fuscous, towards base infuscated, with dark fuscous præapical band, Abdomen whitish-ochreous. Forewings elongate, posteriorly rather dilated, costa gently arched, faintly sinuate in middle, apex obtuse, termen straight, rather oblique; 2 and 3 stalked, 4 approximated, 8 absent, 9 out of 7; pale ochreous; costal edge infuscated at base; discal stigmata cloudy, dark fuscous, first dot-like, second extending across transverse vein, subcrescentic; some slight infuscation along termen: cilia pale ochreous-yellow. Hindwings whitish-ochreous; cilia whitish-yellowish.

Palni Hills, 6,000 feet (Campbell); two specimens.

Frisilia sulcata, n. sp.

♂ ♀. 18-20 mm. Head and thorax deep yellow-ochreous. Palpi yellow-ochreous, in ♀ terminal joint whitish-ochreous, with anterior edge dark fuscous. Antennæ yellow-ochreous, with fuscous præapical band. Abdomen yellow-ochreous tinged with fuscous. Forewings elongate, costa anteriorly gently arched, apex round-pointed, termen in ♂ concave, in ♀ sinuate, somewhat oblique; in ♂ 3 absent, 2 and 4 long-stalked, in ♀ 2 and 3 short-stalked, 4 separate, 8 and 9 out of 7; subdorsal groove in ♂ somewhat sinuate anteriorly; deep yellow-ochreous, sprinkled with dark fuscous specks, in ♀ brownish-tinged; costal edge dark fuscous towards base; discal stigmata dot-like, black, conspicuous; a slender streak of dark fuscous suffusion along termen from apex to near tornus: cilia ochreous-yellow, in ♀ at apex with some dark fuscous suffusion. Hindwings pale grey; cilia pale ochreous.

Khasis, from April to July; Simla, in August; seven specimens.

Frisilia dipsia, n. sp.

♂. 19-20 mm. Head and thorax brown. Palpi brownish-ochreous. Antennæ pale ochreous, more or less spotted with fuscous, with dark fuscous præapical band. Abdomen pale ochreous, sides and segmental margins grey. Forewings elongate, costa gently arched, apex round-pointed, termen sinuate, rather oblique; 3 absent, 2 and 4 stalked, 8 and 9 out of 7; ochreous-brown, considerably sprinkled with dark fuscous; base of costa infuscated; discal stigmata dark fuscous, first forming a rather large dot,

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second a roundish spot of irroration edged anteriorly by a transverse mark, lying below middle and touching groove; a streak of dark fuscous suffusion along termen: cilia pale ochreous, with a partially indicated fuscous line. Hindwings grey; cilia whitish-ochreous tinged with grey.

Maskeliya and Madulsima, Ceylon (Pole, Green, Alston); from December to March, and in June, nine specimens. The absorption of dorsal area in the groove is more considerable in this species than in any of the others.

Frisilia notifica, n. sp.

♂ ♀. 15-17 mm. Head and thorax brownish, sides of crown pale ochreous or sometimes whitish. Palpi in ♂ ochreous, in ♀ whitish, with second joint irrorated with fuscous, anterior edge of terminal joint dark fuscous. Antennæ whitish-ochreous, indistinctly spotted with fuscous, with dark fuscous præapical band. Abdomen grey, apex pale ochreous. Forewings elongate, slightly dilated posteriorly, costa gently arched, apex round-pointed, termen sinuate, rather oblique; in ♂ 3 absent, 2 and 4 stalked, in ♀ 2 and 3 stalked, 4 and 5 approximated, 8 and 9 out of 7; in ♂ ochreous-brownish, sprinkled with dark fuscous, suffused with deep yellow-ochreous along subdorsal groove, which is straight; in ♀ brown irrorated with dark fuscous; costa suffused with dark fuscous towards base; discal stigmata dark fuscous, rather cloudy, first forming a moderately large dot, second a transverse-oblong slightly oblique mark; termen more or less suffused with dark fuscous: cilia in ♂ pale ochreous, in ♀ brownish or pale brownish-ochreous, with two fuscous lines more or less indicated. Hindwings grey; cilia whitish-ochreous more or less wholly suffused with grey.

Maskeliya, Madulsima and Peradeniya, Ceylon (Vaughan, Pole, Green); from November to July, fourteen specimens.

Frisilia heliapta, Meyr.

Similar to *notifica*, but smaller (13-15 mm.), more ochreous in colouring, both discal stigmata dot-like, cilia yellower.

Kandy, Peradeniya, Maskeliya, Madulsima, and Dickoya, Ceylon; from December to June, twenty specimens.

Dolichotorna, n. g.

Head with appressed scales; ocelli present; tongue developed. Antennæ over 1, in ♂ simple, basal joint elongate, without pecten. Labial palpi very long, recurved, second joint thickened with scales, slightly rough towards apex beneath, terminal joint as long as second, in ♂ posteriorly with erect tuft of scales from base and short median protuberance of scales, in ♀ slender, acute. Maxillary palpi very short, filiform, appressed to tongue. Posterior tibiæ clothed with long hairs above. Forewings with 2 from towards angle, 7 absent, 11 from middle. Hindwings 1, very elongate-trapezoidal, apex obtuse, termen rounded, cilia $1\frac{2}{3}$; 3 and 4 out of 5; cell apparently open, 6 and 7 long-stalked.

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A development of *Homaloxestis*.

Dolichotorna hotlias, n. sp.

♂ ♀. 13-14 mm. Head ochreous-whitish, crown in ♀ suffused with pale fuscous except on sides. Palpi whitish, second joint infuscated except towards apex. Antennæ whitish, indistinctly spotted with fuscous. Thorax ochreous-whitish, shoulders dark fuscous. Abdomen ochreous-whitish. Forewings elongate, narrow, costa gently arched, apex tolerably pointed, termen extremely obliquely rounded; brownish, somewhat mixed or in ♂ mostly suffused with ochreous-whitish, somewhat sprinkled with dark fuscous; very undefined markings formed by darker fuscous suffusion coarsely irrorated with blackish-fuscous, *viz.*, a streak along submedian fold, a cloudy patch in disc beyond middle, and a patch occupying apical fourth of wing: cilia in ♂ ochreous-whitish, in ♀ whitish-brownish, with two dark fuscous shades becoming obsolete towards tornus. Hindwings in ♂ pale whitish-ochreous, in ♀ whitish-grey; cilia pale whitisa-ochreous.

Maskeliya, Ceylon (Pole); in January and February, three specimens.

Parelliptis, n. g.

Head with appressed scales; ocelli present; tongue developed. Antennæ 1, rather stout towards base, in ♂ simple, basal joint moderately elongate, without pecten. Labial palpi very long, recurved, second joint thickened with dense appressed scales, slightly rough beneath, terminal joint as long as second, slender, acute. Maxillary palpi very short, filiform, appressed to tongue. Posterior tibiæ rough-scaled above. Forewings with 2 from towards angle, 7 absent, 8 and 9 sometimes stalked, 11 from middle. Hindwings slightly over 1, elongate-trapezoidal, apex obtuse, termen slightly sinuate, oblique, cilia almost 1; 4 absent, 5 rather approximated to 3 at base, 6 and 7 stalked.

A development of *Homaloxestis*.

Parelliptis scytalias, n. sp.

♂. 14-15 mm. Head, antennæ, and thorax whitish-ochreous, shoulders narrowly dark fuscous, thorax and crown sometimes with a cloudy fuscous central line. Palpi whitish-ochreous, second joint dark fuscous except apex, anterior edge of terminal joint sometimes partially dark fuscous. Abdomen whitish-ochreous, suffused with dark fuscous beneath. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen very obliquely rounded; whitish-ochreous, with some scattered fuscous or dark fuscous specks; costal edge dark fuscous towards base; discal stigmata blackish; a rather dark fuscous streak along dorsum from $\frac{1}{4}$ to $\frac{3}{4}$, broad in middle and narrowed to extremities; posterior area from second discal stigma pale ochreous suffused with fuscous except towards costa, undefined anteriorly, darker fuscous towards termen, in one specimen whole wing suffused with rather dark fuscous except a rather broad costal streak and a line along submedian fold: cilia pale ochreous suffused with fuscous, at

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apex with a bar of dark fuscous suffusion, on costa whitish-ochreous. Hindwings grey, paler anteriorly; cilia whitish-ochreous.

Maskeliya, Ceylon (Pole); in July and from October to February, ten specimens.

Eridachtha, n. g.

Head with appressed scales; ocelli present; tongue developed. Antennæ 1, rather stout towards base, basal joint moderate, without pecten. Labial palpi long, recurved, second joint thickened with appressed scales, terminal joint as long as second, slender, acute. Maxillary palpi very short, filiform, appressed to tongue. Posterior tibiæ clothed with hairs above. Forewings with 2 from near angle, 3 separate (in one wing of one specimen 2 and 3 very shortly stalked), 8 and 9 out of 7, 7 to termen, 11 from middle. Hindwings 1, elongate-trapezoidal, apex pointed, termen hardly sinuate, cilia almost 1; 3 and 4 stalked, 5 absent, 6 and 7 stalked.

A development of *Homaloestis*.

Eridachtha prolocha, n. sp.

♀. 15-16 mm. Head, palpi, and antennæ light ochreous-yellowish, second joint of palpi fuscous towards base. Thorax fuscous. Abdomen light fuscous. Forewings elongate, rather narrow, costa anteriorly gently arched, apex round-pointed, termen faintly sinuate, oblique; grey-brown: cilia brownish-grey. Hindwings grey; cilia light grey.

Nilgiris, 3,500 feet (Andrewes); N. Coorg, 3,500 feet (Newcome); in April and August, three specimens.

Homaloxestis, n. g.

Head with appressed scales; ocelli present; tongue developed. Antennæ 1 or over 1, rather stout towards base, in ♂ simple, basal joint moderate, without pecten. Labial palpi very long, recurved, second joint thickened with appressed scales, terminal joint as long as second or somewhat longer, slender, acute. Maxillary palpi very short, filiform, appressed to tongue. Posterior tibiæ clothed with hairs above. Forewings with 2 from towards angle, 3 separate, 4 and 5 sometimes stalked, 7 and 8 stalked, 7 to apex or termen, 9 sometimes out of 7, 11 from middle. Hindwings 1, elongate-trapezoidal, apex more or less pointed, termen faintly sinuate or rounded, cilia $\frac{3}{4}$-2; 3 and 4 connate or stalked, 5 rather approximated, 6 and 7 stalked.

Type *H. endocoma*. This is the genus hitherto termed by me *Lecithocera*.

Homaloxestis callitricha, n. sp.

♂ ♀. 20-21 mm. Head and thorax pale ochreous, sides of crown yellower. Palpi light ochreous-yellowish, scales of second joint somewhat expanded above and beneath. Antennæ whitish-ochreous. Abdomen ochreous-yellow. Forewings elongate, slightly dilated posteriorly, costa gently arched, apex obtuse, termen obliquely rounded; 4 and 5 stalked, 8 and 9

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out of 7; light ochreous-yellowish, more or less sprinkled finely with fuscous discal stigmata blackish, well-marked: cilia light ochreous-yellowish. Hindwings whitish-ochreous, slightly greyish-tinged posteriorly; in ♂ with a large and very long expansible pencil of light ochreous-yellowish hairs lying along subdorsal fold from base; cilia pale yellowish.

Khasis, from July to September, three specimens.

Homaloxestis perizeucta, n. sp.

♂. 20-21 mm. Head and thorax pale brownish-ochreous. Palpi pale ochreous. Antennæ whitish-ochreous. Abdomen ochreous-yellowish, dorsally infuscated. Forewings elongate, slightly dilated posteriorly, costa gently arched towards base and apex, apex obtuse, termen hardly rounded, oblique; 4 and 5 stalked, 8 and 9 out of 7; pale ochreous more or less sprinkled with fuscous; discal stigmata indistinct, fuscous: cilia whitish-ochreous, sometimes tinged with brownish. Hindwings light grey, tinged with whitish-ochreous; cilia whitish-ochreous.

Khasis, in April; two specimens.

Homaloxestis endocoma, n. sp.

♂. 19 mm. Head and thorax rather dark fuscous, face and antennæ light ochreous-yellowish. Palpi ochreous-yellowish, anterior edge of terminal joint dark fuscous. Abdomen whitish-fuscous. Posterior tibiæ light ochreous-yellowish. Forewings elongate, posteriorly dilated, costa slightly arched, sinuate in middle, apex obtuse, termen slightly sinuate, rather oblique; 8 and 9 out of 7; rather dark glossy fuscous; on undersurface with anterior half clothed with light ochreous-yellowish hairs, limited by a large transverse patch of very long curled hairs beyond middle, anteriorly light yellowish, posteriorly fuscous, above which is a longitudinal brush of dense dark fuscous hairs from beneath costa: cilia fuscous. Hindwings fuscous, towards costa posteriorly with modified scales tinged with whitish-ochreous, on anterior half of costa with fringe of very long dense ochreous-yellow hairs projecting beneath forewings; on undersurface with a broad median fascia of ochreous-yellow suffusion clothed with appressed hairs except towards lower extremity; cilia whitish-ochreous, on upper half of termen tinged with fuscous.

Nilgiris, 3,500 feet, in April (Andrewes); one specimen.

Homaloxestis ochrosceles, n. sp.

♀. 15 mm. Head fuscous, face pale fuscous mixed with whitish. Palpi pale fuscous, terminal joint whitish, anterior edge dark fuscous. Antennæ white. Thorax fuscous. Abdomen grey, beneath whitish-ochreous. Posterior tibiæ light ochreous-yellowish. Forewings elongate, costa slightly arched, apex obtuse, termen hardly sinuate, oblique; 8 and 9 out of 7; fuscous: cilia whitish-fuscous. Hindwings grey; cilia whitish-grey.

Peradeniya, Ceylon (Green); in July, one specimen. Immediately distinguished from *cholopis* by the yellow posterior tibiæ.

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Homaloxestis galeodes, n. sp.

♂ ♀. 10-12 mm. Head, palpi, antennæ, thorax, and abdomen glossy whitish-ochreous. Forewings elongate, narrow, costa slightly arched, apex tolerably pointed, termen extremely obliquely rounded; 9 separate; glossy whitish-ochreous, tinged with fuscous: cilia whitish-ochreous. Hindwings grey: cilia whitish-ochreous.

Khasis, in October; thirteen specimens.

Homaloxestis cribanota, n. sp.

♂ ♀. 13-16 mm. Head shining purple-fuscous, sides of crown ochreous-yellowish, face, palpi, and antennæ ochreous-whitish. Thorax fuscous, sometimes partially suffused with ochreous-yellowish. Abdomen in ♂ whitish-ochreous, hairy above, in ♀ fuscous. Forewings elongate, rather narrow, costa slightly arched, apex obtuse, termen extremely obliquely rounded; 9 separate; glossy fuscous: cilia whitish-fuscous. Hindwings grey; cilia whitish-ochreous more or less infuscated.

Khasis, in July and August; Gooty (Campbell); eighteen specimens.

Homaloxestis melicrata, n. sp.

♂. 14-15 mm. Head ochreous-yellow. Palpi pale ochreous-yellowish, lower half of second joint and anterior edge of terminal joint dark fuscous. Antennæ ochreous-yellow spotted with dark fuscous, with a dark fuscous band just below apex. Thorax ochreous-yellow more or less tinged with brownish. Abdomen pale ochreous. Forewings elongate, rather narrow, costa slightly arched, apex obtuse, termen very obliquely rounded; 9 separate; deep ochreous-yellow; markings light brownish irrorated with dark fuscous; a spot on base of costa, and costal edge more or less suffused with dark fuscous irroration from this to $\frac{3}{4}$; an undefined cloudy fascia from $\frac{1}{3}$ of costa to middle of dorsum; a cloudy spot representing second discal stigma; a triangular patch on costa at $\frac{2}{3}$, whence an irregular fascia runs to tornus; an undefined patch on upper $\frac{2}{3}$ of termen, edged by a dark fuscous terminal line: cilia ochreous-yellow. Hindwings whitish-ochreous tinged with grey; cilia whitish-ochreous.

Khasis, in August; three specimens.

Homaloxestis turbinata, n. sp.

♂. 13 mm. Head and thorax ochreous-yellowish. Palpi ochreous-yellowish, lower half of second joint dark fuscous. Antennæ yellowish spotted with dark fuscous. Abdomen grey, sides and anal tuft whitish-ochreous. Forewings elongate, costa anteriorly gently arched, apex obtuse, termen rounded, rather strongly oblique; 9 separate; ochreous-yellow, with some scattered dark fuscous scales; a small dark fuscous spot on base of costa; plical and first discal stigmata represented by small nearly adjacent dark fuscous spots, former slightly anterior; a triangular dark fuscous blotch on costa about $\frac{2}{3}$, its apex produced and reaching $\frac{3}{4}$ across wing; a cloudy dark fuscous streak along upper $\frac{3}{4}$ of termen: cilia

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ochreous-yellow, above apex with a dark fuscous bar. Hindwings pale ochreous-yellowish; a dark grey streak along termen, on lower half more broadly suffused with lighter grey, and connected with an oblique dark grey linear mark on transverse vein; cilia pale yellowish.

Khasis, in June; two specimens.

Lecithocera, H. S.

Head with appressed scales; ocelli absent; tongue developed. Antennæ 1 or over 1, more or less thickened towards base, in ♂ simple, basal joint moderate, without pecten. Labial palpi long, recurved, second joint thickened with appressed scales, terminal joint as long as second or longer, slender, acute, or seldom in ♂ obtuse. Maxillary palpi very short, filiform, appressed to tongue. Posterior tibiæ clothed with hairs above. Forewings with 3 out of 2 or seldom absent, 4 seldom out of 2 or sometimes stalked with 5, 7 to apex or termen, 8 and usually 9 out of 7, or seldom 8 and 9 stalked, 7 absent, 11 from middle. Hindwings 1 or somewhat over 1, trapezoidal, termen hardly sinuate, cilia $\frac{2}{3}$—$\frac{4}{3}$; 3 and 4 connate or stalked or sometimes coincident, 5 rather approximated, 6 and 7 stalked.

Type *L. luticornella*, H. S. There has been much confusion about the specific identity of the type of this genus, but I now find the original description of Herrich-Schaeffer correct in every particular. The generic names *Tiriza*, Walk., *Thubana*, Walk., *Tiva*, Walk., *Inapha*, Walk., *Patouissa* Walk., *Adelomorpha*, Snell., and *Macrotona*, Meyr. are synonyms of this.

Lecithocera bullulata, n. sp.

♂. 17 mm. Head ochreous-white. Palpi white, second joint infuscated on lower half. Antennæ whitish. Thorax whitish, posteriorly infuscated, marked with dark fuscous on anterior edge. Abdomen ochreous-whitish mixed with fuscous. Forewings elongate, costa gently arched, apex round-pointed, termen gently concave, oblique; 3 and 4 out of 2, 8 and 9 out of 7; ochreous-whitish, suffused with pale brownish except a triangular blotch on middle of costa reaching half across wing, and an undefined transverse patch before termen; a small costal mark of dark fuscous suffusion on each side of costal blotch, and a transverse-crescentic dark fuscous mark adjoining its apex posteriorly; a bar of fuscous suffusion near base, some fuscous irroration in disc and towards dorsum before middle, and a cloudy streak of fuscous suffusion along termen: cilia ochreous-whitish, with two fuscous shades. Hindwings rather dark fuscous, lighter and ochreous-tinged towards apex; a round dark fuscous spot in middle of disc, edged anteriorly by a white spot; some slight irregular whitish suffusion towards termen; cilia as in forewings, but shades less defined and tending to be interrupted.

Khasis, in November; one specimen.

Lecithocera eupatris, n. sp.

♀. 18-19 mm. Head white, back of crown tinged with ochreous. Palpi white, anterior edge of terminal joint dark fuscous. Antennæ

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ochreous-whitish, indistinctly spotted with grey towards base. Thorax yellow-ochreous, suffusedly marked with white anteriorly. Abdomen pale ochreous mixed with grey. Forewings elongate, costa gently arched, apex obtuse, termen sinuate, oblique; 2 and 3 long-stalked, 8 and 9 out of 7; bright yellow-ochreous; an ill-defined transverse white line near base: a sinuate white transverse line somewhat before middle: space between these two lines occupied except towards costa by a suffused blackish blotch, more or less sprinkled posteriorly with blue-whitish; three white marks on posterior half of costa, sometimes confluent; a crescentic white mark in disc beyond middle; a blotch of dark fuscous suffusion extending over dorsal half of wing from antemedian line to near termen: cilia light ochreous-yellow. Hindwings light grey, becoming pale ochreous-yellowish towards apex; cilia whitish-yellowish.

Khasis, in September and October; two specimens.

Lecithocera sinuosa, n. sp.

♂ ♀. 9-10 mm. Head and thorax light glossy grey. Palpi whitish-ochreous. Antennæ light ochreous-yellowish spotted with dark grey. Abdomen whitish-grey, anal tuft ochreous-whitish. Forewings elongate, costa gently arched, apex obtuse, termen very obliquely rounded; 2 and 3 stalked, 8 and 9 out of 7; light glossy grey, with a slight purplish tinge; a narrow rather inwards-curved pale ochreous-yellowish fascia from $\frac{3}{4}$ of costa to tornus: cilia light grey. Hindwings with 3 absent (coincident with 4); light grey; cilia pale grey.

Maskeliya and Matale, Ceylon (Pole); from February to August, six specimens.

Lecithocera oxycona, n. sp.

♂ ♀. 11 mm. Head whitish-ochreous, face and in ♀ centre of crown fuscous. Palpi whitish-ochreous, second joint and anterior edge of terminal joint dark fuscous. Antennæ ochreous-whitish, in ♂ much thickened towards base. Thorax rather dark fuscous, anteriorly and on patagia ochreous-whitish. Abdomen whitish-fuscous, anal tuft whitish-ochreous. Forewings elongate, costa gently arched, apex obtuse, termen rounded, rather strongly oblique; 2 and 3 stalked, 8 and 9 out of 7; rather dark fuscous, somewhat pale-sprinkled; a broad whitish-ochreous costal streak from base to about $\frac{3}{4}$, attenuated to a point posteriorly; discal stigmata cloudy, dark fuscous: cilia grey, sprinkled with dark fuscous near base. Hindwings grey; cilia ochreous-whitish, tinged with grey towards base.

N. Coorg, 3,500 feet (Newcome); Gooty (Campbell); Konkan (Young); in June, three specimens.

Lecithocera itrinea, n. sp.

♂. 12-13 mm. Head purple-fuscous, sides yellow-ochreous. Palpi fuscous, more or less wholly suffused with yellow-ochreous. Antennæ yellowish, spotted with dark fuscous, thickened towards base. Thorax

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fuscous. Abdomen light fuscous, anal tuft ochreous-yellowish. Forewings elongate, costa gently arched, apex obtuse, termen nearly straight, oblique; 2 and 3 stalked, 8 and 9 out of 7; brownish, irrorated with dark fuscous; stigmata very cloudy, dark fuscous, plical hardly marked, second discal sometimes forming a transverse mark: cilia light brownish, with two indistinct darker fuscous shades, base pale. Hindwings light fuscous; cilia whitish-fuscous.

N. Coorg, 3,500 feet (Newcome); Ceylon (without further record); from June to September, nine specimens.

Lecithocera semirupta, n. sp.

♀. 16 mm. Head and thorax dark fuscous. Palpi yellowish-fuscous. Antennæ yellowish spotted with dark fuscous, towards base thickened and suffused with dark fuscous. Abdomen fuscous. Forewings elongate, costa slightly arched, apex round-pointed, termen slightly sinuate, rather strongly oblique; 2 and 3 stalked, 8 and 9 out of 7; rather dark ashy-fuscous; stigmata dark fuscous, plical beneath first discal, second discal connected with dorsum by a dark fuscous bar: cilia rather dark fuscous. Hindwings grey; cilia light grey.

Khasis, in October; one specimen.

Lecithocera omphacias, n. sp.

♂. 12 mm. Head purplish-grey, sides of crown whitish-ochreous. Palpi whitish, second joint except apex, and anterior edge of terminal joint dark fuscous. Antennæ ochreous-whitish, indistinctly spotted with grey. Thorax and abdomen grey mixed with darker, anal tuft greyish-ochreous. Forewings elongate, costa slightly arched, apex obtuse, termen very obliquely rounded; 2 and 3 stalked, 8 and 9 out of 7; grey, irrorated with dark fuscous; second discal stigma represented by a cloudy dark fuscous transverse mark: cilia grey. Hindwings grey; cilia pale grey.

Madulsima, Ceylon, in May (Fletcher); one specimen.

Lecithocera mazina, n. sp.

♂. 14 mm. Head brownish-ochreous, sides of crown paler and yellowish-tinged. Palpi pale ochreous-yellowish, second joint tinged with fuscous anterior edge of terminal joint fuscous. Antennæ whitish-ochreous spotted with fuscous. Thorax fuscous. Abdomen light fuscous. Forewings elongate, somewhat dilated posteriorly, costa slightly arched, apex obtuse, termen somewhat rounded, oblique; 2 and 3 short-stalked, 7 absent, 8 and 9 stalked; light greyish-ochreous closely irrorated with fuscous: cilia light greyish-ochreous mixed with fuscous. Hindwings pale fuscous; cilia grey-whitish.

Simla, in July; one specimen.

Lecithocera ichorodes, n. sp.

♂. 15 mm. Head fuscous, sides of crown ochreous-yellow. Palpi dark fuscous, terminal joint ochreous-whitish except anterior edge. Antennæ

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whitish-ochreous. Thorax fuscous mixed with darker. Abdomen grey-whitish, laterally suffused with blackish on posterior half. Forewings elongate, rather narrow, posteriorly somewhat dilated, costa slightly arched, apex obtuse, termen straight, oblique; 2 and 3 stalked, 8 and 9 out of 7; fuscous mixed with dark fuscous; all veins indicated by cloudy whitish-fuscous streaks; costal edge whitish-fuscous except towards base; discal stigmata cloudy, dark fuscous: cilia whitish-fuscous mixed with darker fuscous. Hindwings pale grey, darker towards apex; cilia ochreous-grey-whitish.

Nilgiris, 6,000 feet, in May (Andrewes); one specimen.

Lecithocera proclivis, n. sp.

♀. 16-17 mm. Head brownish, sides of crown ochreous. Palpi pale ochreous, terminal joint whitish-ochreous with dark fuscous anterior edge. Antennæ whitish-ochreous. Thorax brownish. Abdomen pale fuscous. Forewings elongate, rather narrow, costa slightly arched, apex obtuse, termen rounded, rather strongly oblique; 3 absent (coincident with 2), 8 and 9 out of 7; brown sprinkled with dark fuscous; discal stigmata dark fuscous, second connected with dorsum by a small patch of dark fuscous irroration: cilia pale brownish, with two indistinct fuscous lines. Hindwings grey; cilia ochreous-whitish, sometimes tinged with brownish.

Nilgiris, 6,000 feet, in May (Andrewes); two specimens.

Lecithocera autologa, n. sp.

♀. 14 mm. Head, palpi, antennæ, thorax, and abdomen fuscous; antennæ suffused above with dark fuscous towards base. Forewings elongate, costa anteriorly gently arched, apex obtuse, termen faintly sinuate, oblique; 2 and 3 stalked, 8 and 9 out of 7; fuscous, irrorated with dark fuscous; discal stigmata dark fuscous: cilia pale fuscous, with traces of darker shades. Hindwings grey; cilia pale fuscous.

Madulsima, Ceylon, in May (Vaughan); one specimen.

Lecithocera metacausta, n. sp.

♂ ♀. 13-15 mm. Head and thorax brownish with prismatic-violet reflections, sides of crown yellow-ochreous. Palpi ochreous-yellowish, anterior edge of terminal joint dark fuscous. Antennæ ochreous-yellowish spotted with fuscous, in ♀ roughened towards base. Abdomen pale ochreous, in ♀ sometimes infuscated. Forewings elongate, costa gently arched, apex obtuse, termen hardly sinuate, oblique; 2 and 3 stalked, 8 and 9 out of 7; yellow-ochreous, suffusedly sprinkled with brown or dark fuscous; base of costa more or less suffused with dark fuscous; discal stigmata dark fuscous; sometimes a transverse mark of dark fuscous suffusion between second discal and dorsum; a dark fuscous patch along termen from apex, more or less narrowed downwards and not reaching tornus: cilia fuscous mixed with dark fuscous, above apex ochreous-yellowish. Hindwings pale grey or in ♀ sometimes grey; cilia ochreous-whitish, more or less tinged with grey.

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Khasis, from October to March; eight specimens.

Lecithocera aulias, n. sp.

♂ ♀. 12-14 mm. Head yellow-ochreous, crown in ♀ centrally tinged with purple-fuscous. Palpi yellow-ochreous, terminal joint whitish-ochreous with dark fuscous anterior edge. Antennæ ochreous-yellowish spotted with dark fuscous. Thorax ochreous, shoulders suffused with dark fuscous. Abdomen pale ochreous. Forewings elongate, costa gently arched, apex obtuse, termen straight, rather strongly oblique; 2 and 3 stalked, 7 and 8 stalked, 9 approximated or connate or out of 7 near base; in ♂ whitish-ochreous, thinly sprinkled with dark fuscous, costal edge ochreous-yellow, in ♀ ochreous-yellowish, more strongly sprinkled with fuscous and dark fuscous; costa suffused with dark fuscous towards base; discal stigmata black, second connected with dorsum by a transverse variable patch of dark fuscous suffusion: cilia ochreous-yellowish. Hindwings with 3 absent (coincident with 4); light grey; cilia whitish-ochreous.

Khasis, in March and from July to October; four specimens.

Lecithocera hemichrysa, n. sp.

♂ ♀. 19-20 mm. Head dark shining purple-bronze, sides of crown ochreous-yellowish. Palpi in ♂ with second joint rather short, terminal joint twice as long, flatly dilated and somewhat hollowed internally on upper half, obtuse, fuscous, internally pale yellowish; in ♀ normal, yellowish-fuscous, terminal joint pale yellowish with anterior edge dark fuscous. Antennæ and thorax dark fuscous. Abdomen fuscous. Forewings elongate, somewhat dilated posteriorly, costa slightly arched, apex obtuse, termen hardly sinuate, rather oblique; 2 and 3 stalked, 7 and 8 stalked; pale ochreous-yellowish, irregularly irrorated with dark fuscous; costal edge suffused with dark fuscous from base to $\frac{2}{3}$; discal stigmata represented by small dark fuscous spots, second lying on an oblique transverse line of dark fuscous suffusion forming triangular suffused spots on margins; beyond this all veins marked with strong dark fuscous lines; a strong black line round apex and termen: cilia deep ochreous-yellow, outer half metallic golden-bronze. Hindwings grey, tinged with pale yellowish towards apex, veins darker grey; cilia pale ochreous-yellowish, deeper, towards base.

Khasis, in April; two specimens. This distinct species has a superficial resemblance to some forms of *Timyra*, and the modification of the palpi in ♂ also suggests relationship; it is however a true *Lecithocera*, but may really indicate the genetic origin of *Timyra*.

Lecithocera crebrata, n. sp.

♂ ♀. 18 mm. Head glossy dark purple-fuscous, sides of crown ochreous-yellow, face more or less whitish-ochreous. Palpi whitish-ochreous, second joint sprinkled with blackish, anterior edge of terminal joint blackish. Antennæ dark fuscous, beneath pale ochreous-yellowish.

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Thorax dark fuscous, in ♂ mixed with pale yellowish. Abdomen light ochreous-yellowish, on sides mixed with dark fuscous, in ♂ posteriorly with lateral tufts of scales on margins of segments. Posterior tibiæ light ochreous-yellowish. Forewings elongate, posteriorly slightly dilated, costa gently arched, apex obtuse, termen rather obliquely rounded; 2 and 3 stalked, 4 and 5 stalked, 8 and 9 out of 7; pale ochreous-yellowish, in ♂ irregularly irrorated with fuscous and blackish, in ♀ almost concealed with dense purple-blackish irroration; discal stigmata represented by cloudy round purple-blackish spots, their lower extremities connected in ♀ by a streak of pale ground colour: cilia light ochreous-yellowish, in ♂ slightly sprinkled, in ♀ mixed with dark fuscous. Hindwings in ♂ pale ochreous-yellowish, in ♀ rather dark fuscous; in ♂ with a downwards-directed fringe of dense ochreous-yellow hair-scales along lower margin of cell, longest in middle; cilia in ♂ pale yellowish, in ♀ fuscous.

N. Coorg, 3,500 feet, in May (Newcome); two specimens.

Lecithocera choritis, n. sp.

♀. 21-23 mm. Head pale yellow-ochreous. Palpi whitish-ochreous, second joint suffusedly irrorated with dark fuscous except at apex, anterior edge of terminal joint dark fuscous. Antennæ whitish-ochreous dotted with dark fuscous, towards base suffused above with dark fuscous. Thorax rather light purplish-fuscous. Abdomen pale yellow-ochreous. Forewings elongate, slightly dilated posteriorly, costa gently arched, apex obtuse, termen nearly straight, oblique; 2 and 3 stalked, 4 and 5 stalked, 8 and 9 out of 7; pale ochreous-yellowish, irregularly and variably irrorated with purplish-fuscous and dark fuscous; discal stigmata represented by round dark purplish-fuscous spots, connected by a central elongate patch of pale ground colour: cilia pale ochreous-yellowish, with traces of two fuscous shades. Hindwings grey; cilia whitish-ochreous, round apex with two faint fuscous lines.

Palni Hills, 6,000 feet (Campbell); Nilgiris, 6,000 feet (Andrewes); in May, three specimens.

Lecithocera epigompha, n. sp.

♂. 20 mm. Head and thorax brownish-ochreous. Palpi whitish-ochreous, second joint suffusedly irrorated with dark fuscous. Antennæ ochreous-fuscous. Abdomen pale ochreous. Forewings elongate, posteriorly dilated, costa slightly arched, apex obtuse, termen nearly straight, rather oblique; 2 and 3 stalked, 7 and 8 stalked; pale brownish-ochreous, suffusedly irrorated with fuscous except towards costa; base of costa suffused with fuscous; a blackish dot beneath costa near base; stigmata represented by rather large irregular subquadrate blackish spots, plical slightly before first discal and almost connected with it, second discal united with a similar spot beneath it to form a transverse spot; a pale somewhat curved subterminal line indicated by marginal bands of fuscous

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suffusion: cilia whitish-ochreous with two light fuscous shades. Hindwings grey; cilia as in forewings.

Maskeliya, Ceylon, in April (Vaughan); one specimen. Allied to *trigonopis*, but broader-winged, and vein 9 of forewings separate.

Lecithocera homocentra, n. sp.

♂. 17-19 mm. Head and thorax whitish-ochreous. Palpi whitish-ochreous, second joint fuscous except apex, anterior edge of terminal joint dark fuscous. Antennæ whitish-ochreous, spotted with dark fuscous. Abdomen whitish-ochreous, more or less sprinkled with grey, anal tuft ochreous-yellowish. Forewings elongate, posteriorly dilated, costa gently arched, apex obtuse, termen almost straight, oblique; 2 and 3 stalked, 8 and 9 out of 7; pale brownish-ochreous, sometimes tinged with fuscous, especially towards base of dorsum, sometimes partially sprinkled with fuscous; discal stigmata rather large, blackish, plical sometimes indicated by some dark fuscous scales beneath first discal, often absent; a cloudy transverse mark of dark fuscous scales beneath second discal; a series of small dark fuscous dots round posterior part of costa and termen: cilia whitish-ochreous tinged with brownish. Hindwings and cilia whitish-ochreous.

Maskeliya, Ceylon, in July (Pole); six specimens.

Lecithocera ovalea, n. sp.

♂. 16 mm. Head pale ochreous, crown suffused with pale purplish-fuscous. Palpi pale ochreous, lower half of second joint dark fuscous. Antennæ whitish-ochreous. Thorax pale ochreous, shoulders narrowly blackish. Abdomen pale ochreous. Forewings elongate, rather narrow, posteriorly slightly dilated, costa slightly arched, apex obtuse, termen hardly sinuate, oblique; 2 and 3 stalked, 8 and 9 out of 7; brownish-ochreous; a small blackish spot on base of costa; a triangular dark fuscous blotch extending along anterior half of dorsum, its apical half black, apex formed by first discal stigma; second discal stigma represented by a transverse-oblong black spot; a nearly straight pale subterminal line indicated by strong blackish anterior margin, broadly suffused anteriorly with fuscous, which extends on lower half to dorsal blotch; some slight fuscous suffusion towards termen, and a rather dark fuscous cloudy terminal line: cilia light brownish-ochreous, with faint fuscous subbasal shade. Hindwings pale fuscous; cilia whitish-ochreous.

N. Coorg, 3,500 feet, in June (Newcome); one specimen.

Onebala, Walk.

Head with appressed scales; ocelli absent; tongue developed. Antennæ $\frac{4}{5}$—1, in ♂ minutely or sometimes moderately or strongly ciliated, basal joint elongate, without pecten. Labial palpi very long, recurved, second joint thickened with appressed scales, terminal joint usually longer than second or sometimes equal, slender, acute. Maxillary palpi very short,

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filiform, appressed to tongue. Posterior tibiæ clothed with rough scales above. Forewings with 2 and 3 stalked or coincident, 4 and 5 separate or connate or stalked or coincident, 7 to apex, 8 and 9 out of 7 or seldom, 7 absent, 8 and 9 stalked, 11 from middle. Hindwings rather over 1, trapezoidal, termen slightly sinuate, cilia $\frac{1}{2}$—1 ; 3 absent, 4 and 5 connate or stalked or seldom coincident, 6 and 7 stalked.

Type *blandiella*, Walk., *Antiochtha*, Meyr., *Styloceros*, Meyr., and *Organitis*, Meyr., cannot be maintained as distinct, and must be merged in *Onebala*, of which the neuration varies considerably, as in the other allied genera. Four of Walker's species, *amicella*, *blandiella*, *cælatella*, and *agnatella* are referable here ; I have described six others, *cremnaspis*, *tetradelta*, *stellulata*, *achnastis*, *balbidota*, and *characopa*, and now add twenty-three more.

Onebala scopulosa, n. sp.

♂ ♀. 14-15 mm. Head and thorax light greyish-ochreous, sides of crown white or sometimes head wholly whitish, shoulders narrowly dark fuscous. Palpi ochreous-grey, apex of second joint white, terminal joint longer than second, white with base and anterior edge blackish. Antennæ white, sharply ringed with dark fuscous, basal joint white lined with black. Abdomen greyish. Forewings elongate, narrow, costa slightly arched, faintly sinuate in middle, apex obtuse, termen faintly sinuate, oblique ; 3 absent, 5 absent, 8 and 9 out of 7 ; ochreous-grey, sometimes much suffused with whitish, especially towards costa ; a small blackish mark on base of costa ; a rounded-triangular blackish blotch edged with whitish extending on dorsum from $\frac{1}{3}$ to beyond middle, and reaching $\frac{4}{5}$ across wing ; an oblique black white-edged strigula from middle of costa ; a rounded triangular dark fuscous blotch crossing wing posteriorly, its base formed by a whitish line from $\frac{5}{6}$ of costa to tornus, its lower side margined by a curved whitish line preceded by a blackish line, of which the extremity is somewhat enlarged to indicate second discal stigma, edged anteriorly with whitish on transverse vein ; a black line on apical portion of costa : cilia on costa whitish-ochreous, on termen with successive fourths from base whitish-ochreous, brownish, whitish and light grey. Hindwings grey, darker posteriorly ; cilia grey.

N. Coorg, 3,500 feet (Newcome) ; in July, October and November, four specimens.

Onebala clerodotis, n. sp.

♂ ♀. 13-14 mm. Head and thorax light bronzy-fuscous, with a whitish line above eyes. Palpi bronzy-fuscous, terminal joint longer than second, whitish posteriorly. Antennæ white lined throughout with black. Abdomen grey. Forewings elongate, rather narrow, costa gently arched, faintly sinuate in middle, apex obtuse, termen faintly sinuate, oblique ; 3 absent, 4 and 5 stalked, 8 and 9 out of 7 ; fuscous, with a few dark fuscous scales

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a small blackish spot on base of costa; a rounded-transverse blackish-fuscous blotch extending on dorsum from $\frac{1}{4}$ to $\frac{1}{2}$ and reaching $\frac{2}{3}$ across wing, partially whitish-edged; an oblique blackish mark on costa before middle, edged with ochreous-whitish; a curved-transverse blackish-fuscous mark on transverse vein, edged with ochreous-whitish; a moderate blackish-fuscous fascia adjacent to this posteriorly, edged posteriorly by an ochreous-whitish line from $\frac{5}{6}$ of costa to tornus; a black marginal line round apex: cilia whitish-fuscous, base before a broad fuscous shade whitish-ochreous. Hindwings rather dark grey; cilia grey.

Kandy and Maskeliya, Ceylon (Green, Alston); from July to October, four specimens.

Onebala causidica, n. sp.

♀. 20 mm. Head and thorax pale ochreous-bronzy, with a white line above eyes, shoulders fuscous. Palpi ochreous-fuscous, apex of second joint and base of terminal suffused with whitish, terminal joint longer than second, anterior edge dark fuscous. Antennæ white, basal $\frac{2}{3}$ lined or partially spotted with blackish, apical third wholly white. Abdomen fuscous, apex ochreous-yellowish. Middle tibiæ white with dark fuscous basal and supramedian rings, posterior tibiæ dark fuscous with white apical and subapical rings. Forewings elongate, rather narrow, costa slightly arched, faintly sinuate in middle, apex obtuse, termen concave, rather oblique; 3 absent, 4 and 5 connate, 8 and 9 out of 7; fuscous sprinkled with whitish, basal and costal areas more or less wholly suffused with whitish-ochreous; a blackish-fuscous spot on base of costa; two large trapezoidal blackish-fuscous blotches edged with whitish, first extending on dorsum from $\frac{1}{6}$ to middle, one angle almost reaching costa at $\frac{1}{3}$, the other on submedian fold, second blotch with its anterior angles adjacent to a curved blackish-fuscous whitish-edged spot on transverse vein, posterior angles resting on costa at $\frac{5}{6}$ and dorsum before tornus: cilia whitish-ochreous, with a fuscous shade. Hindwings rather dark grey; cilia light greyish-ochreous, with grey subbasal shade.

Khasis, in April; two specimens.

Onebala ocreata, n. sp.

♀. 22 mm. Head and thorax light bronzy-fuscous, sides of crown whitish-ochreous, shoulders purplish-fuscous. Palpi fuscous, apex of second joint ochreous, terminal joint longer than second, dark fuscous, posteriorly ochreous-whitish. Antennæ white, spotted with dark fuscous, basal joint lined with dark fuscous. Abdomen fuscous, apex ochreous-yellow. Middle tibiæ ochreous-white, base dark fuscous, posterior tibiæ dark fuscous, apex ochreous-white. Forewings elongate, rather narrow, posteriorly slightly dilated, costa slightly arched, apex round-pointed, termen concave, rather oblique; 2 and 3 long-stalked, 4 and 5 connate, 8 and 9 out of 7; fuscous sprinkled with whitish; costal edge whitish-ochreous, on basal

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fourth dark fuscous, with a small blackish-fuscous basal spot; a very large blackish-fuscous triangular blotch edged with whitish extending on dorsum from near base to beyond middle, and nearly reaching costa at $\frac{2}{3}$; two connected small round dark fuscous spots on transverse vein, edged with whitish; a large rounded blackish-fuscous blotch immediately beyond this, connected by short bars with costa at $\frac{5}{6}$ and dorsum before tornus, edged with whitish; a blackish line round apex and termen: cilia whitish-ochreous, on termen with a fuscous shade, above apex with a fuscous patch. Hindwings fuscous; cilia light fuscous, base whitish-ochreous.

Palni Hills (Campbell): one specimen.

Onebala horistis, n. sp.

♂. 21 mm. Head bronzy-fuscous, with a white line above eyes. Palpi fuscous, second joint suffused with whitish-ochreous on apical half, apex white, terminal joint longer than second, dark fuscous, posteriorly whitish. Antennæ white lined with dark fuscous. Thorax blackish-fuscous, patagia whitish-ochreous except shoulders. Abdomen fuscous, anal tuft pale ochreous. Middle tibiæ dark fuscous with basal, median, and apical white spots, posterior tibiæ dark fuscous with apex whitish. Forewings elongate, rather narrow, posteriorly somewhat dilated, costa slightly arched, apex obtuse, termen sinuate, somewhat oblique; 2 and 3 long-stalked, 4 and 5 connate, 8 and 9 out of 7; blackish-fuscous; costal area above a line running from base of dorsum to $\frac{4}{5}$ of costa whitish-ochreous, within this basal third of costa suffused with dark fuscous, rest of costal edge ochreous-orange; a slender whitish-ochreous streak running from this pale costal area in middle of wing to dorsum near tornus; a slightly irregular white line from costa near apex to tornus; some cloudy white submarginal dots round apex and termen, and a black marginal line: cilia whitish-ochreous, towards base ochreous-yellow limited by a brownish shade, above apex with a fuscous patch. Hindwings fuscous, towards base paler and yellowish-tinged; cilia pale brownish, towards base ochreous-yellowish.

Khasis, in July; one specimen.

Onebala balanitis, n. sp.

♂ ♀. 26-27 mm. Head and thorax light fuscous, sides of crown pale greyish-ochreous. Palpi whitish-ochreous, second joint suffused with dark fuscous except towards apex. Antennæ whitish-ochreous. Abdomen pale ochreous. Forewings elongate, rather narrow, posteriorly slightly dilated, costa slightly arched, faintly sinuate towards middle, apex round-pointed, termen sinuate, rather oblique; 2 and 3 long-stalked, 4 and 5 connate, 8 and 9 out of 7; fuscous partially tinged with whitish-ochreous; a small blackish-fuscous spot on base of costa; a blackish-fuscous blotch extending along dorsum from $\frac{1}{6}$ to $\frac{2}{3}$, anteriorly rounded and reaching half across wing, narrowed to a point posteriorly, edged with ochreous-whitish; first discal stigma indicated by a small round blackish-fuscous spot resting

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on this; two blackish-fuscous dots on tranverse vein, partially whitish-edged; a blackish-fuscous triangular blotch with apex touching these dots, base rather near and parallel to termen, edged posteriorly by a band of whitish-ochreous suffusion; a dark fuscous terminal line: cilia light greyish-ochreous suffused anteriorly with fuscous. Hindwings fuscous, anteriorly paler and tinged with whitish-ochreous; cilia light brownish.

Palni Hills (Campbell); two specimens.

Onebala straminicornis, n. sp.

♂ ♀. 18-20 mm. Head and thorax purplish-bronzy-fuscous, with an ochreous line above eyes. Palpi pale ochreous-yellowish, second joint suffused with fuscous except towards apex, terminal joint longer than second, dark fuscous anteriorly. Antennæ whitish-ochreous. Abdomen fuscous, apex ochreous-yellowish. Middle tibiæ ochreous-yellowish, with dark fuscous basal and median bands; posterior tibiæ dark fuscous, apex yellowish. Forewings elongate, rather narrow, slightly dilated posteriorly, costa slightly arched, faintly sinuate in middle, apex round-pointed, termen concave, rather oblique; 3 absent, 4 and 5 short-stalked, 8 and 9 out of 7; rather dark purple-fuscous, in ♂ somewhat mixed with pale ochreous suffusion towards costal area between $\frac{1}{4}$ and $\frac{3}{4}$; a triangular blackish-fuscous blotch obscurely edged with pale ochreous, extending on dorsum from $\frac{1}{4}$ to middle, and reaching $\frac{3}{4}$ across wing; an indistinct small oblique blackish-fuscous mark on middle of costa; a narrow transverse blackish-fuscous spot on transverse vein, obscurely pale-edged, upper end enlarged; an indistinct slender pale ochreous line from $\frac{5}{6}$ of costa to dorsum before tornus, preceded by an undefined fascia of blackish-fuscous suffusion dilated in disc so as to reach preceding spot: cilia light ochreous-yellowish, with a broad fuscous antemedian shade, with fuscous patches at apex and tornus. Hindwings fuscous; cilia pale fuscous, base whitish-ochreous.

Maskeliya, Ceylon (Alston, de Mowbray), in April and October; two specimens.

Onebala figurata, n. sp.

♂. 17-18 mm. Head and thorax light bronzy-fuscous or ochreous-bronze, with white line above eyes. Palpi fuscous, second joint whitish towards apex, terminal joint longer than second, whitish with dark fuscous anterior line. Antennæ white, ringed and lined with blackish. Abdomen whitish-ochreous. Middle tibiæ white with dark fuscous basal and median bands, posterior tibiæ fuscous with apex whitish and dark fuscous sub-apical ring. Forewings elongate, rather narrow, slightly dilated posteriorly, costa gently arched, apex obtuse, termen almost straight, oblique; 3 absent, 4 and 5 short-stalked, 8 and 9 out of 7; light fuscous, slightly purplish-tinged, more or less suffused with whitish-ochreous on costal half; a small spot of dark fuscous suffusion on base of costa; a fascia-form blackish-fuscous spot from dorsum before middle, reaching $\frac{2}{3}$ across wing; a short

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dark fuscous oblique streak on costa before middle; a slender sometimes interrupted dark fuscous pale-edged mark on transverse vein; a somewhat incurved whitish-ochreous line from $\frac{4}{5}$ of costa to tornus, edged anteriorly by more or less dark fuscous suffusion; a dark fuscous interrupted line round apex and termen: cilia whitish-ochreous, becoming ochreous-yellow towards base, with a fuscous antemedian shade, at apex and tornus with patches of fuscous suffusion. Hindwings light fuscous tinged with ochreous; cilia whitish-ochreous, on upper part of termen with a light fuscous shade.

Maskeliya, Ceylon (Pole, Green); in June, July, December and January; five specimens.

Onebala caduca, n. sp.

♂ ♀. 14-15 mm. Head and thorax pale ochreous, with a whitish line above eyes. Palpi dark grey tinged with yellowish, apex of second joint whitish, terminal joint longer than second, whitish, anterior edge dark fuscous. Antennæ white ringed with black, near base lined with black. Abdomen grey, anal tuft pale ochreous. Middle tibiæ white with basal and median dark fuscous bands; posterior tibiæ dark fuscous with whitish apical and ante-apical rings. Forewings elongate, rather narrow, posteriorly slightly dilated, costa slightly arched, faintly sinuate in middle, apex obtuse, termen sinuate, oblique; 3 absent, 4 and 5 stalked, 8 and 9 out of 7; whitish-ochreous; a blackish-fuscous mark along costa at base; a very oblique trapezoidal blackish-fuscous blotch extending on dorsum from near base to $\frac{2}{3}$, and reaching rather beyond fold, in ♂ reduced to an elongate spot above fold; a very oblique black strigula from costa before middle; a blackish-fuscous pale-edged mark on transverse vein, upper end enlarged, in ♀ surrounded with some undefined fuscous suffusion; a somewhat sinuate ochreous-whitish line from $\frac{5}{6}$ of costa to tornus, edged anteriorly with dark fuscous suffusion enlarged in disc into a triangular patch almost reaching preceding mark; a blackish line round apex and termen: cilia whitish-ochreous, on basal third ochreous-yellowish. Hindwings light grey, tinged with yellowish; cilia as in forewings.

Khasis, in July; two specimens.

Onebala periastra, n. sp.

♂. 17-18 mm. Head ochreous-whitish, crown suffusedly mixed with dark fuscous. Palpi ochreous-whitish, second joint suffusedly irrorated with dark fuscous on lower $\frac{2}{3}$, terminal joint with more or less indicated line of blackish scales on each side. Antennæ ochreous-whitish. Thorax rather dark purplish-fuscous, apex of patagia ochreous-whitish. Abdomen ochreous-whitish. Forewings elongate, rather narrow, posteriorly slightly dilated, costa slightly arched, apex obtuse, termen concave, oblique; 3 absent, 4 and 5 connate, 8 and 9 out of 7; dark purplish-fuscous, base of scales pale; stigmata represented by small round whitish spots plical slightly beyond

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first discal; small whitish spots on costa at $\frac{2}{5}$ and before $\frac{3}{4}$; whitish dots on dorsum at $\frac{1}{4}$ and towards tornus, latter sometimes connected with second costal spot by a curved series of three or four small whitish dots: cilia dark purple-fuscous, with rows of whitish specks, on basal third slenderly barred with ochreous-whitish, extreme base ochreous-whitish. Hindwings ochreous-whitish tinged with grey: cilia ochreous-whitish, with a faint grey shade.

Maskeliya, Ceylon (Pole); in February, May, July, November and December, nine specimens. Distinguishable from *stellulata* by the round white second discal stigma, represented in that species by a minute dot with a second dot below it.

Onebala oxyzona, n. sp.

♂ ♀. 10-12 mm. Head and thorax rather dark purplish-fuscous, sides of crown ochreous-yellowish. Palpi whitish-yellowish, second joint irrorated with dark fuscous except towards apex, terminal joint longer than second, with incomplete blackish line on each side. Antennæ ochreous-whitish. Abdomen grey, anal tuft whitish-ochreous. Forewings elongate, narrow, costa slightly arched, apex obtuse, termen sinuate, oblique; 3 absent, 4 and 5 connate, 8 and 9 out of 7; purple-fuscous, sprinkled with blackish; costal edge more or less yellowish; markings deep ochreous-yellowish; some undefined suffusion towards costa and fold about $\frac{1}{4}$; two narrow cloudy transverse fasciæ, first before middle, sinuate, second at $\frac{2}{3}$, interrupted in disc; a cloudy ring representing second discal stigma; two dots on costa posteriorly, and a line along termen: cilia dark purple-fuscous sprinkled with whitish points, basal third slenderly barred with yellowish. Hindwings with 4 absent (as well as 3); grey; cilia grey, sprinkled with whitish points.

Maskeliya and Matale, Ceylon (Pole); from February to April, and in August, eleven specimens.

Onebala vigilax, n. sp.

♂. 21-24 mm. Head and thorax whitish-ochreous or pale ochreous tinged with brownish, shoulders dark fuscous. Palpi whitish-ochreous, second joint more or less irrorated with blackish except towards apex, terminal joint longer than second, with an incomplete blackish line on each side. Antennæ light ochreous-yellowish, ciliations 1. Abdomen whitish-ochreous. Forewings elongate, rather narrow, posteriorly dilated, costa slightly arched, faintly sinuate in middle, apex obtuse, termen sinuate, oblique; 2 and 3 stalked, 4 absent, 8 and 9 out of 7; pale yellow-ochreous, partially tinged with brownish, and thinly sprinkled with dark fuscous or black; an undefined basal fascia of dark fuscous irroration; two undefined transverse shades of dark fuscous or blackish irroration, first from $\frac{1}{4}$ of costa to $\frac{2}{5}$ of dorsum, angulated on fold, second from $\frac{2}{3}$ of costa to $\frac{3}{4}$ of dorsum, obtusely angulated in disc, followed by a paler shade with a few white scales;

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stigmata blackish, plical obliquely beyond first discal, these two placed on first transverse shade, second discal transverse, edged with a few white scales; a dark fuscous terminal line: cilia dark fuscous sprinkled with whitish points, basal third barred with whitish-ochreous, base whitish-ochreous. Hindwings pale whitish-ochreous, more or less tinged with fuscous, especially posteriorly; cilia whitish-ochreous, with two more or less developed fuscous shades.

Maskeliya and Patipola, Ceylon (Alston); in February and April, two specimens.

Onebala pselaphistis, n. sp.

♂ ♀. 14-18 mm. Head and thorax pale brownish-ochreous, face and sides of crown whitish-ochreous. Palpi ochreous-whitish, second joint tinged with fuscous, terminal joint longer than second, anterior edge blackish. Antennæ ochreous-whitish, indistinctly spotted with dark fuscous. Abdomen whitish-ochreous. Forewings elongate, rather dilated posteriorly, costa slightly arched, apex round-pointed, termen concave, oblique; 2 and 3 stalked, 4 and 5 separate, 8 and 9 out of 7; light brownish-ochreous, more or less infuscated posteriorly; stigmata small, cloudy, fuscous, plical rather beyond first discal, an additional dot beneath second discal; a faint curved fine ochreous-whitish line from $\frac{3}{4}$ of costa to dorsum before tornus, more strongly marked towards costa: cilia light greyish-ochreous with two fuscous shades, tips whitish on termen. Hindwings grey more or less tinged with whitish-ochreous; cilia whitish-ochreous, sometimes with two faint fuscous shades.

Khasis, in May, August, October and November; five specimens.

Onebala molybdias, n. sp.

♂ ♀. 13-15 mm. Head and thorax fuscous, with a white line above eyes, face paler. Palpi fuscous, terminal joint longer than second, white, with anterior edge black. Antennæ white, ringed and near base lined with blackish. Abdomen grey. Forewings elongate, narrow, costa slightly arched, apex obtuse, termen slightly indented beneath apex, obliquely rounded; 2 and 3 stalked, 4 and 5 separate, 8 and 9 out of 7; brownish, sprinkled with dark fuscous; a bright leaden-metallic spot lying along upper part of termen, preceded by a transverse series of five small white marks edged posteriorly with some black scales; a black dot in apex: cilia light brownish, outer half whitish-grey, at apex with a fuscous projecting hook edged beneath with whitish. Hindwings rather dark grey; cilia grey, basal third sometimes ochreous-tinged.

Maskeliya, Ceylon (Alston, Pole); in February, May, June and from October to December; six specimens.

Onebala propensa, n. sp.

♂. 20 mm. Head ochreous-whitish, tinged with grey on crown. Palpi grey, second joint ochreous-whitish towards apex, terminal joint whitish

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with anterior edge dark fuscous. Antennæ ochreous-whitish. Thorax grey. Abdomen whitish-yellowish. Forewings elongate, rather narrow, posteriorly slightly dilated, costa slightly arched, apex obtuse, termen almost straight, rather oblique; 3 absent, 4 and 5 stalked, 8 and 9 out of 7; grey, slightly violet-tinged, somewhat sprinkled with whitish; costal edge ochreous-whitish from $\frac{1}{3}$-$\frac{4}{5}$; a small oblique dark fuscous mark on costa at $\frac{2}{3}$, and a transverse spot of fuscous suffusion from dorsum opposite reaching half across wing, both edged posteriorly with whitish; discal stigmata dark fuscous, slightly whitish-edged, an additional similar dot beneath and slightly beyond second discal; an almost straight slender white line from $\frac{4}{5}$ of costa to dorsum before tornus; a black line round apex and termen: cilia whitish-ochreous, towards base more yellowish-tinged, with a fuscous antemedian shade. Hindwings grey tinged with ochreous-yellowish; cilia as in forewings.

Patipola, Ceylon (Alston); in April, one specimen.

Onebala byssina, n. sp.

♂. 19 mm. Head fuscous-whitish. Palpi greyish-ochreous, second joint suffused with whitish towards apex, terminal joint longer than second, whitish, anterior edge dark fuscous. Antennæ fuscous-whitish, spotted and near base lined with dark fuscous. Thorax whitish-fuscous. Abdomen pale whitish-yellowish. Forewings elongate, rather narrow, posteriorly somewhat dilated, costa slightly arched, apex obtuse, termen sinuate, oblique; 3 absent, 4 and 5 short-stalked, 8 and 9 out of 7; pale fuscous, sprinkled with dark fuscous; a small dark fuscous spot on base of costa; costal edge ochreous-whitish from $\frac{1}{3}$ to $\frac{4}{5}$; a small oblique blackish mark on costa at $\frac{2}{3}$; a small dark fuscous spot on dorsum at $\frac{}{5}$; stigmata small, dark fuscous, plical rather obliquely beyond first discal, an additional dot beneath and slightly beyond second discal; a faintly incurved slender ochreous-whitish line from $\frac{4}{5}$ of costa to dorsum before tornus, edged anteriorly with rather dark fuscous suffusion; several dark fuscous marginal marks round apex and termen: cilia whitish-ochreous with several suffused fuscous lines, towards base more yellowish-tinged. Hindwings whitish-yellowish, apex and upper part of termen suffused with fuscous; cilia whitish-yellowish.

Maskeliya, Ceylon (Pole); in June, one specimen.

Onebala acrophanes, n. sp.

♂ ♀. 16-20 mm. Head and thorax bronzy-fuscous, face paler. Palpi fuscous, second joint suffused with ochreous-whitish towards apex, terminal joint longer than second, ochreous-whitish, anterior edge dark fuscous. Antennæ ochreous-whitish spotted and near base lined with dark fuscous. Abdomen whitish-ochreous, sometimes suffused with grey. Posterior tibiæ fuscous, apex whitish, with a dark fuscous subapical ring. Forewings elongate, rather narrow, somewhat dilated posteriorly, costa slightly

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arched, apex obtuse, termen hardly sinuate, oblique; 3 absent, 4 and 5 short-stalked, 8 and 9 out of 7; rather dark fuscous, with a slight purplish gloss; an inwardly oblique cloudy darker shade from dorsum before middle, reaching $\frac{2}{3}$ across wing, often obsolete; second discal stigma cloudy, dark fuscous, also often obsolete; a fine line of whitish scales from $\frac{5}{6}$ of costa to tornus, very indistinct except at extremities; an interrupted black line round apex and termen: cilia whitish-ochreous, base more ochreous, with a broad subbasal fuscous shade, above apex and beneath tornus with rather dark fuscous patches. Hindwings fuscous, tinged anteriorly with pale ochreous; cilia whitish-ochreous, with fuscous subbasal shade becoming obsolete on lower part of termen.

Maskeliya and Patipola, Ceylon, throughout the year (Pole, Alston); twelve specimens.

Onebala butyropa, n. sp.

♂. 14-17 mm. Head light ochreous-yellowish. Palpi pale ochreous-yellowish, lower half of second joint suffused with fuscous, anterior edge of terminal joint dark fuscous. Antennæ pale yellowish, ciliations 2. Thorax dark purplish-fuscous. Abdomen whitish-yellowish, sometimes tinged with grey. Forewings elongate, narrow, costa slightly arched, apex obtuse, termen nearly straight, oblique; 2 and 3 short-stalked, 4 absent, 8 and 9 out of 7; rather dark purplish-fuscous; basal area darker purplish-fuscous, its margin formed by an irregular line from $\frac{2}{3}$ of costa to $\frac{2}{3}$ of dorsum; stigmata cloudy, blackish, indistinct, first discal lying on edge of this patch and plical rather obliquely before it; a pale ochreous-yellowish dot on costa at $\frac{5}{6}$: cilia dark fuscous, beneath tornus and towards costal dot with patches of pale ochreous-yellowish suffusion. Hindwings pale grey; cilia whitish-ochreous, with two fuscous shades.

Maskeliya, Ceylon (Pole); in January, three specimens.

Onebala justa, n. sp.

♂ ♀. 11-12 mm. Head grey, face ochreous-whitish. Palpi ochreous-whitish, second joint grey except towards apex. Antennæ rather stout, whitish. Thorax grey irrorated with dark fuscous. Abdomen grey. Middle tibiæ white; posterior tibiæ dark fuscous, apical half white. Forewings elongate, rather narrow, costa slightly arched, apex obtuse, termen slightly rounded, oblique; 2 and 3 short-stalked, 4 and 5 connate, 8 and 9 out of 7; grey closely irrorated with dark fuscous; small ochreous-whitish dots on costa at $\frac{4}{5}$ and tornus: cilia dark grey with rows of whitish points. Hindwings grey; cilia light grey.

Hambantota, Ceylon (Fletcher); in November, two specimens.

Onebala ardua, n. sp.

♂ ♀. 19-21 mm. Head and thorax purplish-bronze, sides of crown ochreous. Palpi dark fuscous, second joint ochreous-whitish towards apex, terminal joint longer than second, whitish posteriorly. Antennæ ochreous-

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whitish. Abdomen greyish-ochreous. Middle tibiæ dark fuscous, extreme apex whitish; posterior tibiæ dark fuscous, hairs above whitish-ochreous or pale ochreous. Forewings elongate, somewhat dilated posteriorly, costa slightly arched, apex obtuse, termen sinuate, somewhat oblique; 3 absent, 4 and 5 separate, 8 and 9 out of 7; brown sprinkled with dark fuscous; stigmata cloudy, dark fuscous, plical beneath first discal, an additional dot beneath second discal; a small spot of dark fuscous suffusion on dorsum beneath plical stigma, and a dot beneath costa beyond first discal; a pale ochreous line from $\frac{4}{5}$ of costa to dorsum before tornus, indented at $\frac{1}{3}$; a series of blackish dots along posterior part of costa and termen: cilia light brown, on tornus with a fuscous subbasal shade. Hindwings and cilia grey.

Khasis, in May, July and September; four specimens.

Onebala elaphopis, n. sp.

♂ ♀. 18-20 mm. Head and thorax dark fuscous, sides of crown pale ochreous. Palpi dark fuscous, terminal joint as long as second, more or less whitish-ochreous posteriorly. Antennæ pale greyish-ochreous, ciliations in ♂ $2\frac{1}{2}$. Abdomen grey, anal tuft greyish-ochreous. Forewings elongate, somewhat dilated posteriorly, costa gently arched, apex rounded-obtuse, termen almost straight, somewhat oblique; 2 and 3 stalked, 4 absent, 7 absent, 8 and 9 stalked; in ♂ an expansible pencil of hairs from base on undersurface covered by costa of hindwings; dark shining bronzy-brown; discal stigmata large, cloudy, dark purple-fuscous: cilia bronzy-brown. Hindwings rather dark grey; cilia brownish.

Khasis, from May to September; eight specimens.

Onebala myadelpha, n. sp.

♂ ♀. 15-19 mm. Head and thorax brownish or rather dark fuscous, sides of crown pale ochreous. Palpi fuscous or rather dark fuscous, terminal joint nearly as long as second, posteriorly ochreous-whitish. Antennæ ochreous-whitish, ciliations in ♂ 1. Abdomen grey, anal tuft pale greyish-ochreous. Forewings elongate, somewhat dilated posteriorly, costa gently arched, apex rounded-obtuse, termen almost straight, somewhat oblique; 2 and 3 stalked, 4 absent, 7 absent, 8 and 9 stalked; in ♂ an expansible pencil of hairs from base on undersurface covered by costa of hindwings; light shining bronzy-brown; stigmata large, cloudy, rather dark purple-fuscous, plical somewhat before first discal: cilia pale bronzy-ochreous or bronzy-brownish. Hindwings grey; cilia pale bronzy-ochreous, sometimes greyish-tinged.

N. Coorg, 3,500 feet (Newcome); Nilgiris, 3,500-6,000 feet (Andrewes); Khasis; from March to May, in August and December; ten specimens. Extremely similar to the preceding species, but distinct by the much shorter antennal ciliations of ♂; also lighter-coloured, plical stigma indicated antennæ paler.

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Onebala lubrica, n. sp.

♂. 13 mm. Head and thorax glossy bronzy-brownish, sides of crown whitish-ochreous. Palpi grey, second joint ochreous-whitish towards apex, terminal joint as long as second, ochreous-whitish, anteriorly grey. Antennæ pale whitish-ochreous, ciliations fasciculated (1). Abdomen grey. anal tuft pale greyish-ochreous. Forewings elongate, costa gently arched, apex rounded-obtuse, termen slightly rounded, somewhat oblique; 2 and 3 short-stalked, 4 absent, 8 and 9 out of 7; glossy bronzy-brownish; second discal stigma large, cloudy, fuscous, very indistinct: cilia light bronzy-ochreous. Hindwings grey; cilia pale ochreous.

Pusa, in July (Lefroy); one specimen. Also very similar to the two preceding, but distinguished by the smaller size, different antennal ciliations, absence of the hair pencil of forewings and of first discal stigma.

Harmatitis, n. g.

Head with appressed scales; ocelli absent; tongue developed. Antennæ $\frac{4}{5}$, in ♂ strongly ciliated ($2\frac{1}{2}$), basal joint moderately elongate, without pecten. Labial palpi very long, recurved, second joint thickened with dense scales, terminal joint longer than second, slender, acute. Maxillary palpi very short, filiform, appressed to tongue. Posterior tibiæ with appressed scales. Forewings with 3 absent (coincident with 2), 8 and 9 out of 7, 7 to apex, 11 from middle. Hindwings somewhat over 1, trapezoidal, apex obtuse, termen faintly sinuate, oblique, cilia $\frac{1}{2}$; 3 absent (coincident with 4), 5 rather approximated, 6 and 7 stalked.

A development of *Brachmia*.

Harmatitis sphecopa, n. sp.

♂. 17-18 mm. Head dark fuscous, face ochreous. sides of crown orange. Palpi pale ochreous-orange, second joint mixed with black towards base, anterior edge of terminal joint black. Antennæ ochreous-yellow. Thorax dark purple-fuscous. Abdomen dark fuscous, apex orange. Forewings elongate, rather narrow, costa slightly arched, apex obtuse, termen sinuate, rather oblique; dark purple-fuscous; costal edge ochreous-orange from about $\frac{1}{5}$ to $\frac{4}{5}$; an irregular transverse ochreous-orange spot on costa before middle, reaching half across wing; a narrow ochreous-orange spot along costa about $\frac{3}{4}$; a group of a few pale ochreous scales above tornus: cilia dark purple-fuscous. Hindwings and cilia dark fuscous, with golden-bronze and purplish reflections.

Peradeniya, Ceylon, in March (Green); two specimens.

Timyra mendicella, Walk.

(*Decuaria mendicella*, Walk., Cat. XXIX, 797; *Timyra torentis*, Meyr., Journ., Bombay Nat. Hist. Soc. XVIII, 449.)

By an unfortunate confusion between this and the following species, which I had wrongly supposed to be *mendicella*, I have re-described the true *mendicella* as *torentis*, thus leaving the other unnamed; I now correct this error.

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Timyra præceptrix, n. sp.

♂ ♀. 21-25 mm. Head bronzy-fuscous, sides of crown yellowish, face whitish-ochreous. Palpi in both sexes sickle-shaped, pale yellowish, lined with blackish, in ♂ with second joint clothed with loose hairs above. Antennæ in ♂ with strong basal tuft of blackish and yellowish scales. Thorax dark bronzy-fuscous, variably mixed with yellow, with a whitish line on each side of back. Abdomen fuscous more or less wholly suffused with pale ochreous-yellowish. Posterior tibiæ with large median tuft of long curved purplish-fuscous and ochreous-yellow scales tipped with black. Forewings elongate, narrow, costa slightly arched, apex obtuse, termen slightly rounded, rather oblique; 7 to apex, 9 out of 7 or separate; dark purplish-fuscous; basal, median, and terminal areas marked with suffused longitudinal orange streaks which are very variable in development, but discontinuous between the areas, most largely developed in ♂; in ♂ a cloudy transverse ochreous-whitish or pale orange transverse line before middle; two short white streaks on veins 8 and 9 towards costa; a whitish line along termen: cilia whitish-fuscous, with three blackish-fuscous lines. Hindwings rather dark fuscous in ♂ more or less suffusedly mixed with ochreous-yellowish along a broad longitudinal median area; in ♂ a subdorsal groove enclosing an expansible pencil of very long whitish-ochreous hairs; cilia fuscous suffuser with yellowish on upper half of termen, with two fuscous shades.

Maskeliya, Pundaluoya, Bogawantalawa, Dickoya, and Maturatta, Ceylon (Pole, Green, de Mowbray); from February to April, and August to October; twelve specimens. Larger than *mendicella*, without the white basal lines of forewings, and further distinguished in ♂ by the hairs of second joint of palpi and yellowish suffusion of hindwings.

Epimimastis glaucodes, n. sp.

♂. 16-17 mm. Head and thorax light grey, lower part of face darker grey. Palpi grey, anterior edge darker. Abdomen light grey. Forewings elongate, rather narrow, costa moderately arched, apex obtuse, termen rounded, rather oblique; grey; a black dot near base above middle; an oval blackish blotch in disc before middle, edged with white; second discal stigma black edged with white; apex and termen somewhat suffused with darker, with a blackish marginal line: cilia light grey. Hindwings light grey; cilia pale whitish-ochreous tinged with grey.

Maskeliya, Ceylon, in June and September (Pole); three specimens.

Dactylethra globulata, n. sp.

♂. 11-12 mm. Head and thorax ochreous-whitish, shoulders sometimes sprinkled with fuscous. Palpi brown mixed with blackish, second joint white anteriorly, terminal joint white with two fine rings of blackish irroration. Abdomen ochreous-whitish. Forewings elongate, rather narrow, costa slightly arched, apex obtuse, termen very obliquely rounded;

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whitish, tinged with brownish and sprinkled with dark fuscous; three moderately large roundish fuscous spots in disc at $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{2}{3}$, sprinkled with darker, first smaller and less marked; a suffused similar patch extending along termen: cilia fuscous-whitish, irregularly sprinkled with dark fuscous. Hindwings grey; cilia whitish.

Puttalam, Ceylon, in September and October (Pole); two specimens.

ŒCOPHORIDÆ.

Syllochitis, n. g.

Head with appressed scales; ocelli absent; tongue developed. Antennæ $\frac{1}{3}$, in ♂ serrate, minutely ciliated, basal joint moderate, with pecten of scales. Labial palpi long, recurved, second joint much thickened with dense scales, slightly rough beneath, terminal joint shorter than second, with dense posterior scale-projection on lower half, acute. Maxillary palpi very short, filiform, appressed to tongue. Thorax with double posterior crest. Posterior tibiæ rough-scaled above. Forewings with rough scales on surface, 2 and 3 stalked, 7 and 8 stalked, 7 to apex (indefinite), 11 from middle. Hindwings 1, trapezoidal-ovate, cilia $\frac{2}{3}$; 3 and 4 connate, 5 somewhat approximated to 4, 6 and 7 nearly parallel.

A development of *Depressaria*, with relationship to *Izatha*.

Syllochitis petræa, n. sp.

♂ ♀. 17-22 mm. Head and thorax dark fuscous, often sprinkled with pale ochreous points, face irrorated or suffused with whitish-ochreous. Palpi purple-fuscous, variably mixed with blackish and sometimes with whitish-ochreous. Abdomen fuscous. Forewings elongate, costa slightly arched, apex rounded-obtuse, termen rounded, somewhat oblique; dark purple-fuscous, with scattered rough black scales; more or less pale ochreous irroration towards costa anteriorly; first discal stigma represented by two very obliquely placed small tufts of black and whitish-ochreous scales second by a larger mostly black transverse tuft; a curved patch of undefined brownish suffusion in disc posteriorly; an undefined black terminal line interrupted with whitish-ochreous: cilia brown tinged with purplish, with rows of whitish-ochreous points. Hindwings thinly scaled, bronzy-fuscous, veins darker; cilia concolorous.

Maskeliya, Madulsima, Matale, Wellawaya, Kegalle, and Puttalam Ceylon (Green, Pole, Alston); from November to February, twelve specimens.

(*To be continued.*)

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NOTES RELATING TO THE DISTRIBUTION, HABITS, AND NIDIFICATION OF *CERTHIA HIMALAYANA*, VIGORS, (THE HIMALAYAN TREE-CREEPER), IN AND AROUND SIMLA, AND THE ADJACENT RANGES.

BY

P. T. L. DODSWORTH, F.Z.S.

This is the only species of Tree-Creeper to be found about these North-West Himalayan ranges, and extends from the foot of the hills to elevations of nearly 12,000 feet.

They are common birds, and are generally to be seen moving about in pairs, although both, while keeping in close proximity to each other, will not, as a rule, be found on the same tree. They are by no means shy, and visit the compounds and gardens here freely. I have often managed to get quite close to one by walking up quietly to the opposite side of the trunk of the tree on which it was ascending, and then standing quite still. The bird soon comes round, and gives one a very good opportunity of observing, at close quarters, its mode of progression. The large claws and feet undoubtedly play the most important part in this—the stiff tail feathers merely acting as auxiliaries.

These birds are not strictly arboreal in their habits, as I have occasionally noticed them feeding on low retaining walls, and once I saw one working along the ground, among some *doob* grass, on a steep hill.

I have never seen them frequenting the thin branches of trees, and the reason for this, perhaps, is that as their barks are generally smooth, they afford no lodgment for insects. If this is so, the birds seem to be well aware of it, for as soon as they have attained a fairly good height in their ascent, and are nearing the smaller branches, they immediately fly off to another tree, and begin to work upwards as usual.

Though strictly passerine, the resemblance of this bird to the woodpecker, in its mode of progression, is very marked. It has often struck me as curious, why these Creepers invariably climb upwards in a *spiral* manner. Does this method of ascent give them a better chance of obtaining food? Observers are silent on this point, and whatever may be the correct reason, one cannot help being struck with the insatiable appetites of these tiny creatures. They never appear to be satisfied, and are perpetually on the move from early in the mornings to late in the evenings. In addition to insects of various kinds, small black ants, and especially their larvæ, appear to constitute their chief nutriment.

These birds are to be seen at all seasons of the year, but generally become more abundant during the early spring and autumn months. The large numbers observed at these periods is doubtless due to their upward and downward seasonal movement along these ranges.

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Its note is a low squeak, but the cock bird has a loud and sweet song during the breeding season.

This Creeper is apparently the true representative of *Certhia familiaris* of Europe.

After an examination of a large number of specimens shot at various times of the year, I have arrived at the same conclusion as Oates that these birds have only an autumn moult.

In nestlings the upper plumage is not so dark as in old birds; the rump and upper tail-coverts show only faint traces of ferruginous; and the fulvous band on the quills is much lighter. The whole of the lower plumage, from the cheek to the vent, is cross-barred with dusky, and the under tail-coverts and flanks are fluffy, and slightly tinged with fulvous. The length of the bill is, of course, much smaller.

The information on record about the nidification of this Creeper is not only very meagre, but, it seems to me, somewhat erroneous and misleading. I am unable to understand how the nests of these birds escaped the observations of so acute an ornithologist as Hume.

In the neighbourhood of Simla and adjacent ranges, courting and building operations commence about the middle, or third week of March. The birds are then very active, and are to be seen constantly flitting from tree to tree, and examining, with great minuteness, all nooks and crannies for likely spots. It is at this period that the cock's song is frequently heard.

They lay from about the last week in March to the first week in May, but most eggs are to be taken during the early part of April. The earliest date on which I have found eggs is the 27th March, and the latest, the 3rd May. Most of the nests examined towards the latter end of April generally contained young.

They have only one brood annually.

Four is the normal number of eggs, but on three occasions I have taken five; and in one instance, I found a nest containing only three young ones, half fledged.

The nests were invariably situated on trees, and were placed sometimes in holes, belonging to other birds, but usually in chinks and crevices formed by thick branches shooting upwards from the main trunks. I have never found their nests on oaks, but have no doubt whatever that they build on these. Their favourite trees here are Himalayan Cedars (*Cedrus deodara*) and Rhododendrons (*Rhododendron arboreum*). The same sites appear frequently to be used year after year, but whether by the same birds or not, it is impossible to say. When the eggs are once removed, the nest is deserted for that year. In one instance only, I succeeded in obtaining an egg from a nest that I had robbed, a few days previously, of four eggs.

The heights of the nests found during the last two or three years varied

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from 2½ feet to 29 feet, but the majority that came under notice were less than 4½ feet from the ground. One nest was placed in a crevice formed by the thick upper roots of a *Cedrus deodara*, which had got exposed, and was actually below the level of the ground.

The eggs were not laid on the bare wood, but the crevices or holes were lined with thick masses of small feathers, in which a few pieces of dry grass and straw were occasionally intermingled. In some cases the nests were mere pads of feathers on which the eggs reposed; in others, the pads were more substantial, and the egg-cavities somewhat deeper.

The nests were shapeless—exactly like those of the ordinary sparrow—and could not stand removal.

The nests take roughly about a week or a fortnight to complete, and both the birds help, not only in carrying materials, but also in the building operations. They seem to become very bold at this time, and I have frequently, from within a few feet of the nest, watched them going in and out of a hole with feathers. As the sexes are alike, it is difficult to make accurate observations, but so far as my experience goes, the hen bird alone appears to perform the labours of incubation. She then becomes fearless, and sits very close. I have frequently caught her on the nest. She generally begins to brood after the first or second egg is laid, and the cock feeds her on the nest. The eggs appear to be laid one daily, (I have only been able to put one nest under observation as regards this point), and take from 13 to 14 days to hatch. Both the old birds help in feeding the young, which leave their home in about three weeks, and follow their parents about for some time, and are fed by them.

The following are some extracts from my daily journal relating to the nidification of this bird:—

(*a*) *27th-30th March.*—Four fresh eggs. Nest consisting of small feathers, straw, etc., and placed in old hole belonging to Woodpecker in small Rhododendron tree; height from ground 9 feet; elevation 6,900 feet. The old bird was caught in the nest, and released after identification.

(*b*) *3rd April.*—(i) Four eggs, slightly incubated. Nest a shallow pad of feathers placed in crevice formed by two thick branches of a Himalayan Cedar (*Cedrus deodara*), shooting upwards from main trunk. Height from ground 2½ feet. Elevation 6,200 feet.

(ii.) Another nest to-day containing five fresh eggs placed in crevice of upper roots of *Cedrus deodara*, which had got exposed, either through the action of the rain, or by the hill on one side having given way. The nest was a pad of feathers, and was actually below the level of the ground. Elevation 6,800 feet.

(*c*) *6th April.*—Another fresh egg from nest (*a*).

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(*d*) 16*th April*.—Four young, just hatched. Nest in small natural crevice of *Cedrus deodara*; height from ground 4 feet. Elevation 6,000 feet.

(*e*) 20*th April*.—Three young, partially fledged; nest in hole of small tree; elevation 6,500 feet.

(*f*) 22*nd April*.—Nest containing five hard set eggs placed in crevice of Rhododendron tree and composed of feathers; height from ground 29 feet. Elevation 7,000 feet.

(*g*) 27*th April*.—Two nests to-day each containing four young; heights of nests from ground 4-4½ feet. Elevation 6,500 feet.

(*h*) 29*th April*.—Nest containing four hard set eggs placed in hole of *Cedrus deodara*: height from ground 4 feet. Elevation about 6,800 feet. The hole was lined with feathers, and the eggs were on the point of being hatched. The hen allowed herself to be caught in the nest. When approaching the tree my foot slipped, and I made a good deal of noise, but in spite of this, the bird did not fly off.

(*i*) 3*rd May*.—Two eggs slightly incubated this year (1910) from nest (*b*). While the eggs were being removed, both birds became greatly agitated, and would frequently creep down the trunk, have a peep at what was going on, and then fly off again. As soon as the eggs were removed, one of the birds disappeared into the hole, and did not come out of it as long as we were there—quite half an hour or so.

(*j*) 9*th May*.—Nest in small Rhododendron containing four young, partially fledged. Height from ground 4 feet. Elevation 6,800 feet.

In shape the eggs are somewhat lengthened ovals, slightly compressed towards the small end. The texture of the shell is fine, and the eggs are glossless.

The ground colour of the majority of the eggs is white; of a few, pale pinkish-white; and they are all heavily spotted and speckled, with brownish-red, chiefly towards the large end, where they become confluent, and from irregular caps or zones. In two eggs these caps or zones are towards the small ends. The amount of markings varies in different specimens. In three eggs, belonging to the same clutch, they are so thick that the ground colour is scarcely visible.

In length the eggs vary from ·65 ins. to ·71 ins., and in breadth from ·47 ins. to ·5 ins.; but the average of 18 eggs measured was ·67 ins. × ·48 ins.

Hume's measurements of 2 eggs = ·69 ins. × ·5 ins., and ·68 ins. × ·5 ins.

Oates' measurements of eggs (number not stated) = ·6 ins. × ·45 ins.

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The weights of four *fresh* eggs were :—

2 at 21 grains each.

2 at 20 „ „

Average weight of the four eggs = 20½ grains.

The weights of three semi-incubated eggs were :—

2 at 18 grains each.

1 at 19½ grains.

Average weight of the three eggs = 18½ grains.

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PLANTS OF THE PUNJAB.

A BRIEF DESCRIPTIVE KEY TO THE FLORA OF THE PUNJAB NORTH-WEST FRONTIER PROVINCE AND KASHMIR.

BY

Colonel C. J. BAMBER, F.L.S.,

Indian Medical Service.

PART VI.

(Continued from page 975 of Volume XIX.)

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

Dianthus Caryophyllus, Carnation, Clove Pink, CARYOPHYLLACEÆ. F. B. I. i. 214. N.-W. F. Province. Attock (Falconer).

medium size, perennial, smooth, greyish green, branched and leafy below, jointed and thickened at the joints; leaves 4-6 by $\frac{1}{8}$ in., linear grooved, pointed, flowers pink, 1-1$\frac{1}{2}$ in. diam., fragrant in loosely branched clusters, bracts 4 broad with an abrupt point, much shorter than the calyx, calyx 1-1$\frac{1}{4}$ in. long, tubular, 5-toothed, petals 5, stalked, smooth, toothed, stamens 10, inserted with the petals on a long process, styles 2; capsule ovoid, 4-toothed, seeds discoid, with a central groove.

Dianthus crinitus, CARYOPHYLLACEÆ. F. B. I. i. 215. Salt Range. N.-W. F. Province. Peshawar. Baluchistan (Lace.)

like the last species, but the bracts 4-8 are lanceolate and long pointed, branches rigid, clusters few-flowered, petals white, scented, fringed nearly to the base.

Tunica stricta, CARYOPHYLLACEÆ. F. B. I. i. 215. Kashmir.

medium size, annual, slender, smooth, branched from the base, leaves radical $\frac{1}{4}$-$\frac{1}{2}$ in. long, numerous, linear with the tip broad and narrowing to the base, stem leaves linear; flowers $\frac{1}{6}$ in. long, white, in

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

clusters of very few flowers without bracts on straight slender stalks, calyx 5-toothed and ribbed, top shaped, petals 5, stalked, linear, oblong, margin even, stamens 10, ovary, 1 celled, styles 2; capsule oblong, opening by 4 teeth, seeds many, boat-shaped, wrinkled on the edges and keel.

Acanthophyllum macrodon,
CARYOPHYLLACEÆ.
F. B. I. i. 216.
N.-W. F. Province.
Waziri Hills (Stewart).

small, perennial, tufted, spinous, minutely velvety; leaves $\frac{1}{2}$-$\frac{3}{4}$ in. long, pale green, stiff with a hard sharp pointed tip, horizontal, flat above, convex below, $\frac{1}{18}$-$\frac{1}{10}$ in. diam. at the base, flowers pink, $\frac{3}{4}$ in. long, terminal, solitary, bracts 4 linear with thin papery margins, rough with projecting processes, recurved, calyx cylindric, 5-toothed, teeth spiny with very narrow thin, papery margins, petals 5, narrow, long stalked, stamens 10, styles 2, ovary 1-celled; capsule ovoid or oblong, 1-2-seeded, seeds almost kidney-shaped, laterally flattened, margin notched.

Saponaria vaccaria,
Musna.
CARYOPHYLLACEÆ.
F. B. I. i. 217.
The Plains to 10,000 ft.
Simla in Cornfields (Collett).
Murree (Douie).
Hazara (Barrett).
Baluchistan (Lace).

medium size, annual, smooth, a weed of cultivation, robust, branches none or only a few; leaves 1-3 by $\frac{1}{2}$-$\frac{3}{4}$ in. radical leaves oblong, short-pointed, stem leaves sessile, base rounded or heart-shaped, linear oblong; flowers pink in terminal many-flowered forked clusters, calyx $\frac{1}{2}$ in. long, cylindric, ovoid in fruit, 5-toothed, with 5 broad, green nerves, petals 5, stalked, short, irregularly toothed, broad at the tip, stamens 10, styles 2; capsule included in the calyx, broadly ovoid, opening at the top by 5 teeth, seeds many, round, large, black. This plant is used as a substitute for soap.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

Silene conoidea,
CARYOPHYLLACEÆ.
F. B. I. i. 218.
The Plains to 8,000 ft.
Simla in Cornfields (Collett).
Gujrat District.
Sargodha (Doule).
Hazara (Barrett).
Rawalpindi.
Baluchistan (Lace).

medium size, sticky from velvety glands, annual, branches forking ; leaves 2-4 in. long, radical leaves broad at the tip narrowing to the stalk, stem leaves oblong or lanceolate, sometimes very narrow, sessile, short-pointed ; flowers pink, few, erect in terminal branching racemes, calyx 1 in. long, base thrust in, 5-toothed, teeth long, sharp-pointed, $\frac{1}{3}$ the length of the calyx, swollen out in fruit, petals 5, broad at the tip, small, margin even or toothed, stalk has a projection ear-like, 2 scales, stamens 10, 5 joined to the petals, styles 3, ovary stalked ; capsule ovoid, shining, pointed, hard enclosed in the inflated calyx, seeds many, shaped like a spiral shell with 5 dorsal and 5 lateral rows of tubercles.

Silene Moorcroftiana,
CARYOPHYLLACEÆ.
F. B. I. i. 219.
Himalaya, 10-13,000 ft.

medium size, perennial, stems many, stock woody, densely tufted, flowering branches erect, slender dividing or not at the top, velvety ; leaves radical, broad at the tip, narrowing to the base, stem leaves shorter, linear, long or short-pointed or blunt ; flowers white or reddish in terminal or nearly terminal clusters of one to three flowers, calyx 1-1$\frac{1}{4}$ in. long, tubular, sticky, base projecting inwards, slender below the middle, nerves 10, dark, teeth short blunt with thin pepery margins, petals divided into 2, the segments strap-shaped, protruding from the calyx, stalk with a long tooth on both sides, also 2 long scales, stamens 10, 5 joined to the petals, styles 3 on a stalk longer than the capsule ; capsule ovoid, seeds flattened, not grooved, with 5 rows of latteral and dorsal tubercles.

Silene arenosa,
CARYOPHYLLACEÆ.
F. B. I. i. 219.
N.-W. F. Province, Peshawar.
The Plains.
Attock.
Baluchistan (Harsukh.)

small, annual, slender, bluish green, sticky, much-branched from the root, velvety, flowers open at night ; leaves $\frac{3}{4}$-1$\frac{1}{2}$ in. long, stiff, narrow, long-pointed, margins rolled up ; flowers $\frac{2}{3}$ in. long in few flowered widely dividing clusters, stalks $\frac{1}{2}$-1 in. long, thread-like, calyx $\frac{1}{2}$-$\frac{2}{3}$ in. long, club-shaped, slender, 10-ribbed, base pushed inwards, teeth with

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HERBS, ERECT WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

thin papery margins, petals with the blade divided, lobes linear, stalk with a tooth on each side, scales 2, small, lanceolate; capsule oblong, the style stalk equal to the capsule; for other characters, see the last species.

Silene tenuis,
CARYOPHYLLACEÆ.
F. B. I. i. 219.
Himalaya, 8-12,000 ft.

small, perennial, smooth or sticky with glands, many stems from the root, slender unbranched; leaves 1-3 in., short or long-pointed, narrow, linear or lanceolate, often with scattered hairs, flat, radical leaves slightly broadened upwards, flowers ½ in. long, dirty yellow or brown, often in a circle in short racemes, stalks ⅙-¼ in., bracts short, in a circle, awl shaped, calyx bell-shaped ⅓-½ in., thin, base rounded or abrupt, 10 nerved, teeth blunt, spreading, petals divided, stalk with two teeth, hairy, scales short oblong; capsule oblong, seeds with 5 dorsal and lateral rows of tubercles; other characters like the last species.

Silene Griffithii,
CARYOPHYLLACEÆ.
F. B. I. i. 220.
Himalaya, 7-11,000 ft.

medium size, perennial, stout, velvety or hairy, stems divided or not; leaves 2½-4 by ¾-1¼ in., radical leaves lanceolate with a broad tip ending in a broad stalk, stem leaves oblong, sessile, velvety on both surfaces; flowers white in opposite axillary irregularly 3-flowered clusters, shortly stalked, calyx ¾-1 in. long, cylindric, barely dilated above except in fruit, teeth short-pointed, not bordered with white, nerves 10, green, base rounded or abrupt, petals deeply 2-lobed, lobes divided into 3-6 parts, no scales, no teeth on stalks of petals; capsule oblong, ovary shortly stalked, seeds minute, sides flat or convex, back grooved; other characters like the last species. This plant is used in Lahoul with an alkali as a substitute for soap.

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HERBS, ERECT WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

Silene Webbiana, CARYOPHYLLACEÆ. F. B. I. i. 220. Himalaya, Sirmur.

medium size, slender, very like Silene viridiflora Linn., leaves 1½ in. broad, stem leaves ovate stem-clasping, long-pointed, 5-9-nerved; flowers greenish white, drooping in loose opposite long-stalked clusters, calyx ¾ in., very slender, 10 nerved swollen in fruit, teeth with thin edges, petals long, blade divided, lobes strap-shaped, scales 2, styles 3; capsule cylindric, oblong; other characters like the last species.

Cucubalus baccifer, CARYOPHYLLACEÆ. F. B. I. i. 221. Himalaya, 5-8,000 ft.

medium size, rambling, velvety with curly white hairs; leaves 1-2 by ¾-1 in., ovate lanceolate, short-pointed, thin with scattered hairs, narrowed into the stalk, upper leaves sessile; flowers greenish white, nodding in 1-3 flowered loose leafy clusters or solitary in the forks of the branches, calyx ⅓ in., 5-toothed, broadly bell-shaped, 10-nerved, base-rounded, teeth large, broad, nearly short-pointed, petals 5, 2 lobed, stalk narrow toothed at the top, blade of petal with 2 scales at the base, stamens 10, styles, 3; capsule round, black, the size of a pea, tip crowned with a projection, shining, dry or fleshy, becoming thin, seeds minute, many, kidney-shaped with a lateral depression.

Lychnis coronaria, CARYOPHYLLACEÆ. F. B. I. i. 222. Kashmir, Valley in groves and fields (Jacquemont).

medium size, perennial, covered with white wool, sparingly branched; leaves 3-5 in., lanceolate with a broad tip narrowed to the stalk, stem leaves oblong; flowers red purple, on long stalks, calyx ¾-1 in., top-shaped, 10-nerved, teeth 5, twisted to the left, petals 5, 1 in. or more in length, with 2-toothed stiff scales at the stalk, heart-shaped with a notch at the margin, broad, stamens 10, styles 5; capsule nearly sessile, within the calyx, 5-valved, valves with an even margin, seeds many, doubly convex.

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HERBS, ERECT WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

Lychnis Cachemeriana, CARYOPHYLLACEÆ. F. B. I. i. 224. Kashmir (Royle).

medium size, straight, stout, unbranched, with grey hairs, leaves 2-3 by $\frac{1}{2}$-$\frac{2}{3}$ in., narrow, ovate to linear-lanceolate, slightly rough; flowers white, large, erect or nodding in nearly terminal contracted clusters, calyx $\frac{3}{4}$-1 in. long, green, oblong, teeth 5, short or long pointed, nerves many, branching, petals 5, blade $\frac{1}{3}$ in. long, stalk woolly, blade 2-fid, lobes divided, stamens 10, styles 5; capsule ovoid, 5-fid, on a woolly stalk, seeds many, kidney-shaped, granulate.

Lychnis Stewartii, CARYOPHYLLACEÆ. F. B. I. i. 224. Himalaya, Upper Chenab and Chamba River, 8-11,000 ft. (Stewart).

small, stiff slender, upper part sticky and woolly, leafy; leaves 2 by $\frac{1}{16}$-$\frac{1}{12}$ in., very narrow, linear, spreading, 1-nerved, keeled by the stout mid-rib, margins turned in; flowers white, $\frac{3}{4}$ in. long, solitary or in opposite pairs with 2 linear bracts above the middle, in the upper leaf axils, nodding, calyx $\frac{1}{3}$ in. long, oblong, velvety, nerves green faint, free or united, teeth 5, rounded, edges thin with long curled hairs, petals 5, heart-shaped with a notched margin, blade very short, scales 2, notched, divided into two, curved back, stalk very broad with a tooth on each side, petals projecting beyond the calyx, stamens 10, styles 3, very short; capsule ovoid, projecting out of the calyx, 10-fid, stalk woolly.

Lychnis indica, CARYOPHYLLACEÆ. F. B. I. i. 225. Himalaya, 5-10,000 ft. Simla (Collett). Changlagalli (Doule).

medium size, leafy, branches dividing into forked pairs, very slightly velvety; leaves 1-5 by $\frac{1}{3}$-$2\frac{1}{2}$ in., ovate lanceolate to orbicular, lower leaves stalked; flowers creamy white inside and purplish outside, erect or nodding in open or close many-flowered branching sticky hairy clusters, stalks without bracts, calyx $\frac{1}{2}$-$\frac{3}{4}$ in. long, velvety, bell-shaped, nerves 10-15, simple or branched, teeth 5, broad, blunt, rarely short-pointed, petals 5, much longer than the calyx, blade 2-fid or divided into several processes, 2 erect crisped scales at the base of the

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HERBS, ERECT WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

blade, forming with other petal scales a crown over which the anthers project, stamens 10, styles 5, twisted, silvery; capsule ovoid, teeth 5, simple or bifid, stalk short, velvety, seeds many, minute, very dark, kidney shape, granulate.

Lychnis hutans,
CARYOPHYLLACEÆ.
F. B. I. i. 225.
Himalaya, 9-12,000 ft.
Murree, Hattu (Collett).

very like the last species, but smaller, calyx more rounded and shorter, petals purple and limb shorter and less divided.

Lychnis pilosa,
CARYOPHYLLACEÆ.
F. B. I. i. 226.
Himalaya, 9-12,000 ft.

very like the last species, but covered with long hairs and the seeds with longer projections.

Cerastium dahuricum,
CARYOPHYLLACEÆ.
F. B. I. i. 227.
Himalaya, 10-11,000 ft.
Murree (Stewart).
Matiana, Hattu (Collett).

large, perennial, stems stout, ascending among shrubs to 12 ft. or straggling over grass, smooth; leaves $1\frac{1}{2}$-2 in., large, oblong, sessile or eared, united, blunt or short pointed, margin projecting; flowers white, $\frac{3}{4}$ in. diam., long stalked without bracts in much forking clusters, sepals 5, unevenly, oblong, short-pointed, shining with thin margins, $\frac{2}{3}$ in., ovate-lanceolate; petals 5, 2-lobed, heart-shaped, twice the lengh of the sepals, stalks bearded, stamens 10, styles 5; capsule straight, twice the length of the calyx, many-nerved, teeth recurved, seeds flattened, many.

Cerastium vulgatum,
Mouse-ear chickweed,
CARYOPHYLLACEÆ.
F. B. I. i. 228.
The Plains to 15,000 ft.
Simla (Collett).

small, annual, velvety, more or less sticky, a weed of cultivation, stems many, simple or branched, stout or slender; leaves $\frac{1}{2}$-1 in., lower broad at the tip narrowing to the stalk, upper oblong or ovate, blunt or short-pointed; flowers $\frac{1}{6}$-$\frac{1}{3}$ in. diam., in clusters few or many flowered, open or crowded, or in umbels or heads, sepals 5, lanceolate about $\frac{1}{4}$ in. long, margins broad, petals 5, rarely none.

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HERBS, ERECT WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

equal to the sepals in length, shortly lobed, stamens 10, sometimes 5 or less, styles 5; capsule cylindric, much longer than the calyx, often curved, like a horn (cerastos), whence the name is derived, teeth straight, seeds many, flattened.

Cerastium Thomsoni,
CARYOPHYLLACEÆ.
F. B. I. i. 228.
Himalaya, at Kishtwar and Lahoul, 10-12,000ft.

small, hairy, very glandular, branched only at the base; leaves $\frac{3}{4}$-$1\frac{1}{4}$ in. long, linear-oblong, nearly short-pointed, straight; flowers $\frac{1}{2}$-$\frac{3}{4}$ in. diam., white in few flowered nearly umbel-like clusters, bracts with narrow thin margins, stalks slender, sepals 5, oblong-lanceolate nearly short-pointed, coloured below the thin tips, much smaller than the petals, petals 5, broad, capsule cylindric, twice the calyx, teeth 10, seeds many, flattened.

Stellaria crispata,
CARYOPHYLLACEÆ.
F. B. I. i. 229.
Himalaya, 6-10,000 ft.
The Glen.
Simla in shady places (Collett).
Baluchistan (Lace).

large, smooth, slightly velvety above, stems quadrangular, shining with a line of fine hairs, joints often hairy; leaves 3-8 in. long, lanceolate or oblong, rather leathery, tips slender, margin more or less crisped, sessile, long pointed; flowers white, small in much branched clusters, terminal, sepals $\frac{1}{6}$ in. 5, oblong-lanceolate, long-pointed, margin narrowly thin and dry, often sticky, petals 5, 2-fid, as long as or twice as long as the sepals, stamens 10, styles 3; capsule short, 3-celled, seeds one or two granulated.

Stellaria paniculata,
CARYOPHYLLACEÆ.
F. B. I. i. 229.
Himalaya, 7-9,000 ft.
Fagu, Narkunda (Collett).

medium size, very like the last species but the stem is reclining and the leaves are not crisped; flowers are smaller, petals notched, shorter than the sepals, capsule equal to the calyx, seeds wrinkled.

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HERBS, ERECT WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

Stellaria bulbosa,
CARYOPHYLLACEÆ.
F. B. I. i. 231.
Himalaya, 6-9,000 ft.
Jamu to Murree,
(Jacquemont).
Hazara (Barrett.)

small, smooth, root stock creeping, bearing small round underground branches with buds or eyes, stem slender, erect, unbranched with a line of hairs; leaves 2-6 pairs, 1-1½ ins. long, ovate with a broad tip or unequally lanceolate, hardly short pointed, rather fleshy, sessile or narrowed into a stalk, margins rarely hairy; flowers of two kinds, the lower on the plant from slender stalks being minute without petals bearing ripe seeds, the nearly large flowers, ½ in. diam., rarely producing seed, sepals 4 or 5, green, oblong-lanceolate or lanceolate, ½-⅔ in., shorter than the petals, petals 4 or 5, white, ovate oblong, shortly 2-lobed, stamens 10, with purple anthers, styles 2, thread-like; capsule 8-angled, valves 4 divided to the base, seeds few, large, furnished with excrescences on the surface.

Stellaria glauca,
CARYOPHYLLACEÆ.
F. B. I. i. 233.
Himalaya, Lahoul,
(Jaeschke).

medium size, perennial, slender, quite smooth, stem quadrangular; leaves 1-2 ins. long, sessile, oblong or linear-lanceolate, long-pointed, base rounded, margins thickened; flowers ½-¾ in. diam., white on nearly solitary terminal rather stout straight stalks, bracts thin, sepals 4 or 5, more or less united at the base, linear-oblong, long or short-pointed, green, petals 4 or 5, broad, 2-lobed, twice as long as the sepals, stamens 10, slender, styles 3, rarely 4; capsule broadly ovoid, 4-6 valved, valves undivided, equal in length to the sepals, seeds many, very granulate.

Arenaria Meyeri,
CARYOPHYLLACEÆ.
F. B. I. i. 236.
N.-W. F. Province,
Peshawur, (Stewart).
Baluchistan.

small, annual, covered with spreading glandular hairs, stem cylindric, branches in parallel clusters; leaves ¼-½ in., linear, awl-shaped, recurved; flowers ¼ in. diam., white in clusters, sepals 5, ⅓ in. long, green, erect, rigid, sharp, margins white, petals 5, very short, ovate-oblong, not divided, stamens 5-7,

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HERBS ERECT WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

styles 3; capsule oblong, much shorter than the sepals, 3-valved; seeds many, red-brown, round, notched, flattened.

Arenaria foliosa,
CARYOPHYLLACEÆ.
F. B. I. i. 236.
Himalaya, 9-13,000 ft.

small, perennial, quite smooth, branched from the base, slender, leafy; leaves $\frac{1}{3}$-$\frac{2}{3}$ by $\frac{1}{17}$ in., spreading, never stiff or sharp, very narrow, linear, bright green; flowers white, $\frac{1}{4}$ in. diam. on long-stalked, almost umbelled, clusters, bracts and bracteoles leathery, concave, short-pointed, calyx rounded and not thickened at the base, sepals 5, $\frac{1}{6}$ in., leathery, sharp; petals 5, longer than the sepals; stamens 5, styles 3, capsules ovoid, larger than the sepals; valves 3, recurved; seeds many, small pale brown, kidney-shaped, granulate on the back.

Arenaria kashmirica,
CARYOPHYLLACEÆ.
F. B. I. i. 236.
Himalaya, 6-7,000 ft.
Lahoul (Jaeschke).

very like the last species, but glandular, velvety, leaves stiffer and sharper, flowers smaller with longer petals.

Arenaria holosteoides,
Kakua, gandial.
CARYOPHYLLACEÆ.
F. B. I. i. 241.
Himalaya, 7-12,000 ft.
Murree (Douie).
Baluchistan (Boissier).

large, slender, pliable, smooth or velvety, much-branched, leaves 1-3 ins., linear or linear-oblong, sessile, base broad, short or long-pointed; flowers $\frac{1}{4}$-$\frac{1}{2}$ in. diam., white, nodding in few-flowered clusters, flower stalks slender widely separated, no bracts, calyx not thickened at the base; sepals 5, blunt, linear-lanceolate to broadly ovate-oblong, green with thin edges, smooth or very hairy and glandular at the back; petals 5, equal to or longer than the sepals, tip with a shallow notch, broad; stamens 5, styles 2-3, thread-like, long; capsule nearly round, shorter than the calyx, very thin, 2-6-valved to the base; seeds $\frac{1}{6}$, red-brown or blackish, with rows of sharp tubercles.

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HERBS ERECT WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

Hypericum perforatum, Common St. John's Wort, *Bassant, dendlu.* HYPERICACEÆ. F. B. I. i. 255. Himalaya, 3-8,000 ft. Simla in shady forest, (Collett).

medium size, perennial, stem 2-angled, lowest branches rooting; leaves ¾ in. long, oblong or ovate, blunt, dotted with translucent glands, pale below with black dots, sessile; flowers 1 in. diam., yellow in terminal or axillary short-stalked clusters; sepals 5, ⅙ in. long, united at the base, linear, short-pointed; petals 5, persistent, with black glandular edges; stamens many in 3 bundles; anthers black-dotted; styles 3, as long as the stamens; ovary 3-celled; capsule ⅓ in. long, ovoid, seeds many, small.

Hypericum elodecides, HYPERICACEÆ. F. B. I. i. 225. Himalaya, 6-12,000 ft. Simla, Narkanda in shady forest, (Collett).

medium size, perennial, stems round, lowest branches rooting; leaves 1-1½ ins. long, ovate, blunt or lanceolate, short-pointed, base stem-clasping margins black-dotted; flowers ¾ in. diam., in clusters of branching racemes; sepals 5, ¼ in. long, narrowly lanceolate, black-dotted and streaked, margins with gland-tipped teeth; petals 5, persistent, black-dotted and streaked; in other characters like the last species.

Vahlia viscosa, SAXIFRAGACEÆ. F. B. I. ii. 399. The Plains.

small, annual or biennial, velvety with sticky glands; leaves ½-1 in. long, nearly sessile, oblong, narrowed at both ends, short-pointed; flowers ⅙ in. long, white, nearly sessile, in pairs or solitary in nearly all the axils of the upper leaves, calyx tube united to ovary and above it; lobes 5, ovate and short-pointed, persistent in fruit; petals 5, ⅙ in. long, ovate with a broad tip united to the ovary; stamens 5 and styles 2, both ⅙ in. long; capsule ⅛ in. diam., one-celled, nearly round, splitting at the top between the styles; seeds minute, many, smooth.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

Ammania pentandra, LYTHRACEÆ. F. B. I. ii. 568. The Plains in moist places.

small, annual, many opposite branches, covered with flowers; leaves 1 in. long, sessile, unevenly oblong, floral leaves bract-like, oblong broad-based; flowers very small, solitary sessile axillary, bracteoles awl-like, as long as the calyx, calyx enclosing the ovary, teeth 10, petals 5, narrow or none, stamens 5, on the calyx tube, style one, thread-like or short, stigma round; capsule round or depressed, 3-celled, 3-valved, seeds black, round. The different species of Ammania are used in native medicine to raise blisters.

Ammania baccifera, see Herbs, Erect, Opposite, Exstipulate, Simple, Petals none.

Ammania salicifolia, see Herbs, Erect, Opposite, Exstipulate, Simple, Petals none.

Ammania senegalensis, see Herbs, Erect, Opposite, Exstipulate, Simple, Petals none.

Ammania multiflora, see Herbs, Erect, Opposite, Exstipulate, Simple, Petals none.

Epilobium angustifolium, ONAGRACEÆ. F. B. I. ii. 582. Himalaya, 8-12,000 ft.

medium size, smooth; leaves 3-6 by $\frac{3}{4}$ in., nearly sessile, short-pointed, margin even or minutely toothed; flowers $\frac{3}{4}$ in., rose purple in spikes at the ends of branches, bracts narrow, soon falling off, calyx tube scarcely produced above the ovary, covered with close white wool, linear, teeth 4, lanceolate, long-pointed, purplish, almost petal-like, petals 4, $\frac{1}{2}$-$\frac{5}{8}$ in., ovate with a broad tip, stalked, stamens 8, on the ovary, bent on one side, 4 shorter, style cylindric, hairy above the base, stigmas 4, distinct, spreading; capsule linear, 4-celled, splitting from the apex, $2\frac{1}{2}$-$3\frac{1}{2}$ ins., velvety, valves 4, recurved, seeds many, narrowly ovoid, smooth, crowned with a tuft (coma) of dirty yellow silky hairs.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNUNITED.

Epilobium latifolium, ONAGRACEÆ. F. B. I. ii. 583. Himalaya, 11-14,000 ft. Kashmir.

small, smooth; leaves $1\frac{1}{2}$-3 by $\frac{1}{4}$-$\frac{3}{4}$ in., oblong, narrowed to both ends, margin even or minutely toothed, blunt or short-pointed; flowers on stalks in the axils of distant leaves, no bracts; in other characters like the last species.

Epilobium origanifolium, see Herbs, Erect, Alternate, Exstipulate, Simple, Entire.

PETALS UNITED.

Rubia tibetica, RUBIACEÆ. F. B. I. iii. 204. Himalaya, 10-14,000 ft. Kulu (Hay).

small, rough, perennial, root thick woody, bundles of stamens each $\frac{1}{4}$ in. thick, stout, with glistening white bark, erect, annual shoots clustered together, simple or branching, nodes of the stems covered with thin bases of old leaves; leaves $\frac{1}{2}$-1 by $\frac{1}{4}$-$\frac{1}{2}$ in., sessile, broadly ovate, round or lanceolate, often in a circle of four leaves, leathery, margins and midrib rough; flowers $\frac{1}{4}$ in. diam., in axillary or terminal clusters, shorter than the leaves, or solitary on long axillary stalks, calyx tube ovoid or round, no teeth, corolla bell-shaped, lobes 4-5, lanceolate, short-pointed, stamens 4-5, anthers round, style 2-branched, ovary 2-celled; fruit $\frac{1}{8}$ in. diam., smooth, round or almost 2-lobed, seeds 2, small.

Galium boreale, RUBIACEÆ. F. B. I. iii. 205. Himalaya, 5-11,000 ft. Kashmir, Lahoul.

medium size, perennial, smooth or velvety, branches square; leaves 1-2 by $\frac{1}{4}$-$\frac{1}{2}$ in., 4 in a circle, lanceolate blunt, stiff, margins rough, sessile, 3-nerved, from the base; flowers minute, white in nearly erect axillary and terminal many-flowered clusters with ovate bracts, calyx tube ovoid or round, teeth none, corolla wheel-shaped, lobes 4, nearly pointed, stamens 4 in the corolla tube, anthers 2-lobed, style short, 2-branched, ovary 2-celled; fruit $\frac{1}{12}$ in. diam., 2-lobed, dry, covered with hooked hairs, seeds 2, small, flat on one side, convex on the other.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

Galium triflorum, RUBIACEÆ. F. B. I. iii. 205. Himalaya, 6-10,000 ft. Mashobra, Mahasu, Narkanda (Collett).

small, perennial, smooth, stems sometimes straggling; leaves, long and short, $1\frac{1}{2}$-$2\frac{1}{2}$ by $\frac{1}{4}$-$\frac{1}{2}$ in. and $\frac{1}{2}$-1 by $\frac{1}{4}$-$\frac{1}{2}$ in., the long sessile, the short stalked, 6-8 in a circle or the short 4 in a circle, lanceolate, not 3-nerved from the base; flowers whitish yellow, minute in axillary or terminal few-flowered clusters: otherwise like the last species.

Galium tricorne, RUBIACEÆ. F. B. I. iii. 207. The Plains, Waziri, and Attock Hills, Kashmir, to 13,000 feet.

medium size, annual, very rough, stem stout, branches square; leaves 1-$1\frac{1}{2}$ by $\frac{1}{8}$-$\frac{1}{6}$ in., linear, stiff, 6-8 in a circle, point rigid tapering; flowers white, minute on long or short stout axillary, 1-3-flowered stalks, corolla lobes ovate short-pointed; fruit smooth, $\frac{1}{6}$ in. diam.: otherwise like the last species.

Galium verum, RUBIACEÆ. F. B. I. iii. 208. Himalaya, 5-10,000 ft. Kashmir, Lahoul.

small, perennial, smooth, stem velvety upwards; leaves $\frac{1}{2}$-1 by $\frac{1}{12}$-$\frac{1}{8}$ in., 8-10 in a circle, linear, point rigid tapering, sessile, margins turned in; flowers bright yellow, minute in very many short many-flowered clusters; fruit $\frac{1}{10}$ in. diam., smooth; otherwise like the last species.

Galium tenuissimum, RUBIACEÆ. F. B. I. iii. 208. The Plains at Rawalpindi, Kashmir, 5-6,500 ft.

small, annual, very slender, the plant appears broad above and narrow below, the stem dividing into two, the branches into two or three, rough with the roughness directed downwards, leafy at the forks only; leaves $\frac{1}{2}$-$\frac{3}{4}$ by $\frac{1}{16}$ in., 6 in a circle, linear, rough with scattered bristles, margins turned in; flowers white or yellowish, minute in large loose-flowered clusters on long slender stalks, corolla lobes sharp, stiff pointed, fruit $\frac{1}{12}$ in. diam.; otherwise like the last species.

Galium setaceum, RUBIACEÆ. F. B. I. iii. 208. The Plains, Hissar (Aitchison).

small, annual, stems round, minutely rough or smooth; leaves $\frac{1}{2}$-$\frac{3}{4}$ by $\frac{1}{30}$ in., upper filiform, short pointed, bristly, margins turned in, lower shorter, broader at the tip not bristly; flowers most minute, yellow in terminal and lateral few-flowered clusters

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LEAF MARGINS ENTIRE.

PETALS UNITED.

on slender stalks equal to or longer than the leaves; fruit $\frac{1}{20}$ in., smooth or with a few hooked hairs; otherwise like the last species.

Galium ceratophylloides, RUBIACEÆ. F. B. I. iii. 209. Kashmir, 8,500 ft. Pusiana, (Clarke).

small, stems hardly branching, short, 4-angled, very slender, quite smooth; leaves $\frac{1}{2}$ in., in close set circles of six, rather weak, finely long-pointed with bristles, minutely rough towards the tip; flowers very minute, yellowish in axillary 3-flowered clusters on erect stalks shorter than the leaves with two awl-like bracts at the tip, corolla segments lanceolate, long-pointed; otherwise like the last species.

Galium vernum, see Herbs, Prostrate, Opposite, Exstipulate, Simple.

Asperula cynanchica, RUBIACEÆ. F. B. I. iii. 209. Himalaya, Kashmir, 8,000 ft.

small, perennial, smooth, rarely just velvety, stock woody, stems many, slender, round, branches square; leaves $\frac{1}{4}$-$\frac{2}{3}$ by $\frac{1}{12}$-$\frac{1}{8}$ in., small, linear oblong, blunt, lower in circles of 4, upper in pairs; flowers $\frac{1}{16}$ in. long, pink or white in slender clusters or heads at the naked tips of branches with 2 small linear oblong bracts, corolla funnel-shaped, lobes 4, triangular, shorter than the tube, fruit $\frac{1}{12}$ in. diam.; otherwise like Galium.

Asperula brachyantha, RUBIACEÆ. F. B. I. iii. 209. Himalaya, Kashmir, 7-12,000 ft.

very like the last species, but with shorter leaves in pairs, shorter blunter bracts, and woolly longer corolla; flowers more in heads.

Scabiosa Olivieri, see Herbs, Erect, Opposite, Exstipulate, Lobed.

Scabiosa speciosa, see Herbs, Erect, Opposite, Exstipulate, Lobed.

Spilanthes Acmella, see Herbs, Erect, Opposite, Exstipulate, Simple, Toothed.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

Anagallis arvensis, Pimpernel, *Jonkmari.* PRIMULACEÆ. F. B. I. iii. 506. The Plains to 7,000 ft. Simla in fields, (Collett). Baluchistan (Lace).

small, annual, slender, branches square growing from the base; leaves ½-1½ in., ovate or lanceolate, short-pointed, dotted with glands; flowers bright blue, rarely scarlet, ½ in. diam., open in sun-light on solitary axillary slender stalks, longer than the leaves, erect in flower, bent down in fruit, calyx segments 5, narrow lanceolate, long-pointed, nearly as long as the corolla, corolla wheel-like, segments 5, with a few hairs, stamens 5, very hairy, ovary 1-celled, style thread-like; capsule size of a small pea, round, opening by a circular slit round the middle, seeds many, minute, 3-angled. This plant is used by Indians to cure cerebral diseases.

Cynanchum Vincetoxicum, ASCLEPIADACEÆ, F. B. I. iv. 22. Himalaya, 7-11,000 ft. Shali, Sangri, Patarnala, (Collett).

small, perennial, velvety or smooth, juice milky; leaves 2 by 1½ in., broadly ovate, shortly stalked, pointed; flowers ⅕ in. diam., yellow, in sessile or stalked branching racemes or flat clusters, axillary, calyx segments 5, corolla wheel-shaped, lobes 5, smooth, a ring of 5 erect triangular oblong or rounded scales (corona) united to the staminal tube, stamens 5, united, flattened, anthers 2-celled, projecting over the stigmas, forming a 5-angled disk, carpels 2; follicles 2-4 in. long, smooth, slender, tapering, seeds many, flattened, winged, and crowned with a brush of fine hairs.

Cynanchum glaucum, ASCLEPIADACEÆ. F. B. I. iv. 22. Himalaya, 5-9,000 ft. Simla, Mashobra, (Collett).

medium size, perennial, woolly or velvety, pale or bluish-green, juice milky; leaves 1-3 by 1½-2½ in., ovate, oblong or lanceolate, leathery, short or long-pointed, stalk ¼-½ in. long, flowers ⅙ in. diam., yellow in nearly sessile velvety umbelled clusters, calyx segments 5, corolla lobes 5, hairy within, coronal lobes 5, rounded, broad, fleshy, stamens, etc., as in last species; follicles 2-4 in., slender, seeds

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LEAF MARGINS ENTIRE.

PETALS UNITED.

$\frac{1}{4}$-$\frac{1}{3}$ in. long, broadly ovoid, concave on one side, convex on the other, crowned with a bunch of fine hairs.

Cynanchum Arnottianum,
ASCLEPIADACEÆ.
F. B. I. iv. 22.
Kashmir, 6-8,000 ft.
Dunglagalli (Douie).

very like the last species, but sometimes with the leaves in circles, and the corolla smaller and dark purple.

Cynanchum Jacquemontianum,
ASCLEPIADACEÆ.
F. B. I. iv. 26.
Kashmir.
Baluchistan (Boissier).

small to medium size, perennial, smooth, branches many, slender from a woody stock, juice milky; leaves 1-1$\frac{1}{2}$ by $\frac{1}{2}$-$\frac{2}{3}$ in., small, lanceolate from a broad heart-shaped base, finely long-pointed, stalk $\frac{1}{4}$-$\frac{1}{3}$ in.; flowers $\frac{1}{4}$-$\frac{1}{3}$ in. diam., many in level clusters on stalks longer than the leaves, calyx segments ovate, corolla velvety within, corona equal to the corolla, 5-fid, lobes finely lanceolate, simple or divided with a small flat process below; otherwise like the last species.

Ceropegia Wallichii,
ASCLEPIADACEÆ.
F. B. I. iv. 67.
Himalaya, 4-8,000 ft.
Simla, Prospect and Elysium Hills, Shali (Collett)

small, velvety, stem $\frac{1}{3}$ in. diam.; leaves 2-2$\frac{1}{2}$ in., ovate or rounded, nearly sessile, tip blunt short-pointed or rounded; flowers dark red-purple, $\frac{3}{4}$-1 in. long, in crowded stalked clusters on a very short axillary main stalk, bracts bristly, calyx segments 5, narrow, $\frac{1}{4}$ in. long, thread-like, corolla tube narrow, base swollen, mouth funnel-shaped, sharply 5-angled, lobes $\frac{1}{3}$ in. long, erect, narrow, tips joining, within it 10 coronal scales, in 2 series, outer united in a short 10-lobed cup joined to the staminal tube, inner longer, linear, erect, ununited, stamens 5, united into a very short tube, anther tips blunt; follicles smooth, tapering, 2$\frac{1}{2}$ in., long-pointed, seeds crowned with a bunch of hairs.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

Caralluma edulis, *Chang, pipu, sittu.* ASCLEPIADACEÆ. F. B. I. iv. 76. The Plains, Rawalpindi, Multan.

small, fleshy, branched or not, stem and branches 4-grooved, nearly round, sometimes leafless; leaves ½ in. long, soon falling off, ovoid-lanceolate, short-pointed, fleshy; flowers ⅛ in. diam., purple within, solitary or in pairs in the upper leaf axils, calyx lobes 5, short-pointed, corolla smooth, broadly bell-shaped, lobes 5, narrow, ovate-lanceolate, tube enlarged, coronal scales in a ring, joined to the staminal column, 5-lobed, lobes 2-pointed, with a process on the inner face which overlaps the anthers, staminal column very short, anthers short, with a shallow notch at a rounded apex, resting on, or joined to the stigma, stigma flat; follicles slender, smooth, round, seeds crowned with a bunch of hairs. This plant is eaten by the poor as a vegetable.

Exacum tetragonum, *Titakhana, ava chiretta.* GENTIANACEÆ. F. B. I. iv. 95. The Plains to 5,000 ft.

medium size to large, stem square, little branched below; leaves 5 by 1½ in., short-pointed, or 1½ by ⅔ in., nearly blunt, 5-nerved, sessile or stem clasping, broadly lanceolate; flowers blue, 1¼ in. diam., in terminal branching racemes, calyx deeply 4-lobed, lobes ½-⅔ in. long, ovate, long-pointed, keeled, or sometimes hardly 3-winged, corolla wheel-shaped, lobes 4, ¾ in. long, oblong, short-pointed, stamens 4, on the corolla tube, anthers ¼ in., straight, style ½ in. long, thread-like, stigma round; capsule ⅛ in. diam., nearly round, seeds very many, minute. This plant is used by Indians as a tonic bitter in place of Chiretta.

Exacum pedunculatum, GENTIANACEÆ. F. B. I. iv. 97. The Plains to 3,000 ft.

small, stem square, much branched; leaves 1¾ by ½ in., oblong with rounded ends or lanceolate, 3-nerved, nearly sessile; flowers ⅔ in. diam., blue in many-flowered terminal rigid stalked clusters on main stalks ⅛-½ in. long, calyx lobes 4, ⅙-⅕ in. long, ovate, long pointed, wing distinct lanceolate, corolla wheel-shaped, lobes 4, ¼-⅓ in. long, oblong with rounded ends, stamens 4, anthers ⅛ in., style long stigma nearly round; capsule ⅙ in., nearly round,

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LEAF MARGINS ENTIRE.

PETALS UNITED.

valves 2, seeds very many, minute. This plant is used by Indians as a bitter tonic in place of gentian.

Hoppea dichotoma, GENTIANACEÆ. F. B. I. iv. 100. The Plains to 3,000 ft.

very small, annual, smooth, stem square, much branched; leaves $\frac{1}{4}$ in. long, ovate, sessile; flowers $\frac{1}{12}$ in. white in sessile 2-3 flowered dense or loose clusters, calyx $\frac{1}{12}$ in., bell-shaped, lobes 4, ovate, long-pointed, thin, green marginal nerve, corolla bulging on one side, shorter than the calyx, tube $\frac{1}{20}$ in., lobes short, triangular, stamens 4, 1 perfect, 3 barren, in the throat of the corolla, style short, stigma hardly divided, capsule nearly round, very small, seeds very many, minute, nearly black.

Enicostema littorale, *Chota kirayata.* GENTIANACEÆ. F. B. I. iv. 101. The Plains to 1,500 ft.

small, annual, smooth, stem round or square, branched, spaces between leaves short; leaves 2 by $\frac{1}{2}$ in., or smaller and nearly linear, ovate-lanceolate, sessile; flowers $\frac{1}{5}$ in. long, white or bluish in sessile axillary clusters, calyx $\frac{1}{10}$ in., deeply divided into 5 lobes, which are narrowly oblong and blunt, corolla funnel-shaped, tubular, tube $\frac{1}{8}$ in., lobes 5, $\frac{1}{10}$ in., spreading, oblong with rounded end, stamens 5, in the upper part of corolla tube, scales at the base, anthers oblong, short-pointed, within the tube, style short, linear, stigma round; capsule $\frac{1}{8}$-$\frac{1}{6}$ in., oblong with rounded ends, seeds many, nearly round, larger than those of the last species. This plant is bitter and used in place of quinine or chiretta.

Erythræa ramosissima, GENTIANACEÆ. F. B. I. iv. 101. The Plains, 1-2,000 ft. Ludhiana, Hoshiarpur (Thomson). Baluchistan (C. B. Clarke).

small, branched, very leafy; leaves $1\frac{1}{2}$ by $\frac{2}{3}$ in. sessile, stem leaves oblong, short-pointed or with rounded ends; flowers $\frac{1}{4}$ in., pink in sessile bracteate clustrers, calyx $\frac{1}{3}$ in., tubular, teeth 5, lanceolate or linear, with a prominent ridge, equal to the corolla tube, corolla tube $\frac{1}{4}$ in., lobes 5, spreading, stamens 5, near the mouth of the corolla tube, short, linear, style linear, stigmas oblong; capsule $\frac{1}{3}$ in., oblong, nearly 2-celled, seeds very small.

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LEAF MARGINS ENTIRE.

PETALS UNITED.

Erythræa Roxburghii, see Herbs, Unbranched, Simple, Entire.

Erythræa Meyeri, see Herbs, Unbranched, Simple, Entire.

Erythræa babylonica,
GENTIANACEÆ.
F. B. I. iv. 102.
The Plains.
Lahore.
Rawalpindi (Douie).

small, stem unbranched below, square with sharp angles; leaves $\frac{1}{2}$-$\frac{1}{6}$ in., radical leaves 2, none when in flower, stem leaves oblong, distant from one another; flowers $\frac{3}{8}$ in., pink, nearly sessile in equally branching clusters, calyx $\frac{1}{3}$ in., nearly as long as the corolla tube; otherwise like *Erythræa ramosissima*. Douie notes that the pedicels and calyx are longer in the Rawalpindi specimens.

Canscora diffusa,
GENTIANACEÆ.
F. B. I. iv. 103.
The Plains to 4,000 ft.

small to medium size, annual, stem square, densely branched above; leaves $1\frac{1}{2}$ by $\frac{1}{2}$ in., 3-nerved, often stalked, lower leaves lanceolate or oblong with a rounded end, upper passing into ovate, short-pointed, sessile, thin bracts; flowers $\frac{1}{5}$ in., pink on slender, zigzag stems in loosely spreading leafy terminal clusters, bracts $\frac{1}{2}$ in., leaflike, a few uppermost linear, calyx $\frac{1}{5}$ in., tubular, 4-toothed, round, keeled, teeth lanceolate-linear, corolla tube $\frac{1}{5}$ in., cylindric, lobes 4, $\frac{1}{6}$ in., long, nearly 2-lipped, stamens 4, one larger perfect on the corolla throat, 3 smaller lower down, style linear, stigmas 2, short; capsule $\frac{1}{5}$ in. oblong, seeds minute, dark-brown, many-sided.

Canscora decussata,
Sankkapuli.
GENTIANACEÆ.
F. B. I. iv. 104.
The Plains to 5,000 ft.
Valleys below Simla (Collett).

small to medium size, annual, stems square, the angles winged; leaves $1\frac{1}{2}$ by $\frac{1}{2}$ in., sessile, oblong-lanceolate, 3-nerved; flowers $\frac{1}{2}$ in., white on stalks in the forks of erect winged branches of clusters, calyx $\frac{1}{3}$-$\frac{1}{2}$ in., with narrowly lanceolate wings, corolla tube equal to the calyx in length, lobes $\frac{1}{4}$ in., ovate, with broad blunt tips, otherwise like the last species but the capsule and seeds much larger. This plant and the preceding are used as laxatives and nerve tonics by Indians.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

Gentiana Moorcroftiana, GENTIANACEÆ. F. B. I. iv. 108. Himalaya, 8-12,000 ft. Kashmir, Lahoul.

small, nearly smooth, stem with 4 lines running down it, branched; leaves 1 by $\frac{1}{2}$ in., oblong-pointed or with the ends rounded, narrow below, bases sometimes joined; flowers $\frac{1}{2}$-1 in., blue in nearly terminal racemes, calyx tubular, tube $\frac{1}{10}$ in., lobes 4-5, linear $\frac{1}{3}$ in., corolla tubular, funnel-shaped, mouth $\frac{1}{3}$ in. diam., lobes 4-5, stamens 4-5, within the tube, style short or none, stigmas 2; capsule $\frac{2}{3}$ in., lanceolate, dividing into 2, seeds very many, small, yellow-brown. All the gentians are bitter stomachic tonics and are used by the natives of India.

Gentiana tenella, *Tita.* GENTIANACEÆ. F. B. I. iv. 109. Kashmir, 10-14,000 ft.

small, sometimes straggling, stem with 4 lines, branched; leaves $\frac{1}{2}$ by $\frac{1}{4}$ in., oblong or ovate, lowest broad at the tip narrowed to the stalk; flowers bluish, $\frac{1}{2}$ in. diam. on terminal solitary stalks 1-3$\frac{1}{2}$ in. long, calyx-tube barely any, lobes 5, $\frac{1}{5}$ by $\frac{1}{10}$ in. oblong with the end rounded, unequal, corolla tubular, tube $\frac{1}{2}$ by $\frac{1}{5}$ in., lobes $\frac{1}{4}$ in., oblong with the end rounded; capsule $\frac{2}{3}$ in., oblong-linear, sessile; otherwise like the last species.

Gentiana aquatica, GENTIANACEÆ. F. B. I. iv. 110. Kashmir, 13-16,000 ft.

small, branches many from the base, little divided, leaves $\frac{1}{4}$-$\frac{1}{3}$ in., stem leaves $\frac{1}{5}$ in. ovate or with a broad tip, margins turned in, usually blunt, with a bristle at the tip; flowers blue $\frac{4}{10}$ in. on solitary terminal stalks $\frac{1}{8}$-$\frac{1}{2}$ in. long, calyx $\frac{1}{4}$-$\frac{1}{3}$ in., lobes 5, in., lanceolate, short-pointed, smooth, margins even, erect, corolla tube hardly longer than the calyx, lobes 5, short, with folds, bifid between the lobes; capsule $\frac{1}{5}$ by $\frac{1}{8}$-$\frac{1}{6}$ in., short ovoid with broad top, flattened, stalk $\frac{2}{3}$ in. long, capsule projecting beyond the calyx, seeds 3-angled, not much longer than broad; otherwise like the last species.

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HERBS, ERECT WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

Gentiana quadrifaria, GENTIANACEÆ. F. B. I. iv. 111. Himalaya, 3-10,000 ft. Simla, Matiana (Collett). Kashmir.

small, annual or biennial, branching from the base, stems many ; leaves green, radical leaves persistent, rosulate, 1-1½ ins., ovate or lanceolate, stem leaves ¼-½ in., leathery ; flowers ⅓ in. long, blue in terminal, 3-5 flowered stalked clusters, calyx shorter than the corolla tube, teeth 5, lanceolate, rigid, often irregularly toothed, corolla ¼-½ in., lobes 5, with small bifid folds between, stamens and style as in *G. Moorcroftiana*, capsule ⅕ by ⅛-⅙ in., ovoid, nearly projecting from the calyx ; seeds many, small, smooth, 3-angled.

Gentiana decemfida, GENTIANACEÆ. F. B. I. iv. 112. The Plains from 1-3,000 ft. Sutlej Valley, Suni (Collett). Hoshiarpur.

small, annual, branches ascending ; leaves silvery shining, radical leaves 1 by ⅓ in.,nearly sessile,ovate with an abrupt bristle point, stem leaves ¼-½ in., stiff uppermost lanceolate ; flowers ⅓ in. long, blue in lateral and terminal shortly stalked clusters, calyx ⅓ in., lobes 5, ⅙ in., narrowly lanceolate, glistening, corolla ⅓ in., hardly longer than the calyx, lobes 5, folds bifid stamens and styles as in the last species ; capsule ⅓, by ⅛ by ⅙ in., shortly oblong with rounded ends, enclosed in the calyx, stalk ¼ in., seeds many, very small, oblong with the ends rounded and barely 3-angled.

Gentiana argentea, GENTIANACEÆ. F. B. I. iv. 112. Himalaya, 7-12,000 ft. Simla (Collett). Murree (Douie).

small, annual, almost exactly like the last species but the leaves are more silvery and the uppermost leaves surround the flowers which are closely clustered almost into a head.

Gentiana capitata, GENTIANACEÆ. F. B. I. iv. 113. Himalaya, 4-12,000 ft. Simla (Collett).

small, annual, stems branched or not, bared of leaves below ; leaves ½ by ¼-⅓ in., green, broadly ovate with a broad tip, thick, shining with a bristle at the tip, flowers blue or white, sessile, ¼ in. long, clustered in leafy heads ½-¾ in. diam., calyx ¼ in., lobes ⅛ in., 5, oblong, short-pointed, edges thin, corolla ¼-⅓ in., lobes 5, folds with a notch at the tip,

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PETALS UNITED.

stamens and style as in the last species ; capsule $\frac{1}{6}$ in. long and broad, round, flattened, stalk $\frac{1}{6}$ in., nearly enclosed in the calyx, seeds many, very small, oblong, with rounded ends, nearly twice as long as broad, smooth, 3-angled.

Gentiana carinata, GENTIANACEÆ. F. B. I. iv. 113. Himalaya, 8-12,000 ft. Kashmir.

small, annual, stem branched, radical leaves $1\frac{3}{4}$ by $\frac{1}{3}$ in., persistent, oblong lanceolate, sessile, short-pointed, stem leaves similar, smaller, curved, flowers nearly sessile, lateral and terminal, clustered, calyx tube $\frac{1}{4}$ in., lobes 5, $\frac{1}{6}$ in., shorter than the tube, lanceolate, long-pointed, erect, corolla $\frac{1}{2}$ by $\frac{1}{6}$ in., tubular fringed, lobes 5, folds bifid, stamens and style as in the last species ; capsule $\frac{1}{5}$ by $\frac{1}{8}$ in., oblong with rounded ends, flattened, seeds many, small oblong with rounded ends, nearly 3-angled, smooth.

Gentiana cachemirica, GENTIANACEÆ. F. B. I. iv. 115. Himalaya, 9-12,000 ft. Kashmir.

small, annual, branches often long, leafy and numerous from the root, radical leaves 1 by $\frac{1}{3}$ in., ovate oblong broader at the tip, short-pointed with a bristle at the point, stem leaves $\frac{1}{3}$-$\frac{2}{3}$ in. ; flowers 1-$1\frac{1}{4}$ in. blue, solitary, sessile, calyx tube $\frac{1}{3}$ in., bell-shaped, lobes 5, $\frac{1}{4}$ in., oblong with a broad tip, a broad space between the lobes, corolla 1-$1\frac{1}{4}$ in., tubular with a bell-mouth, lobes 5, $\frac{1}{5}$ in. ovate, short-pointed, erect, folds between the lobes, stamens and styles as in last species ; capsule $\frac{1}{3}$ by $\frac{1}{6}$ in., seeds many, small, round, glistening, white.

Gentiana venusta, see Herbs, Prostrate, Opposite, Exstipulate, Simple.

Gentiana nubigena, see Herbs, Unbranched, Simple, Entire.

Gentiana Kurroo, see Herbs, Unbranched, Simple, Entire.

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HERBS, ERECT WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

Gentiana detonsa, GENTIANACEÆ. F. B. I. iv. 118. Kashmir, 9-15,000 ft.

medium size, much branched, leaves $1\frac{1}{2}$ by $\frac{1}{4}$ in., oblong linear, much apart, hardly joined at the base; flowers $\frac{3}{4}$-$1\frac{1}{4}$ in. long, scattered on small stalks in clusters on main stalks 1-8 in. long on branches, calyx tube $\frac{1}{2}$ in., cylindrical, funnel-shaped, lobes 4, $\frac{1}{3}$ in., 2 lobes ovate-lanceolate, 2 lanceolate, corolla tube 1 by $\frac{1}{4}$ in., lobes 4, $\frac{2}{3}$ in., fringed or toothed, stamens and style as in the last species; capsule $\frac{3}{4}$ by $\frac{1}{4}$ in., stalk $\frac{1}{3}$ in., seeds nearly oblong, minutely scaly and netted.

Gentiana contorta GENTIANACEÆ. F. B. I. iv. 118. Himalaya, 5-8,000 ft. Simla, Summer Hill (Collett).

small, annual, branching, leaves 1 by $\frac{1}{3}$ in., ovate, stems 2-7 flowered; flowers blue, 1-$1\frac{1}{4}$ in. long on stalks, $\frac{1}{4}$-$\frac{3}{4}$ in. in racemes, calyx tube $\frac{1}{3}$ in., cylindrical, funnel-shaped at the mouth, lobes 4, $\frac{1}{3}$ in. ovate, short-pointed, unequal, corolla tube $\frac{2}{3}$ in. with 4 large oblong glands within near the base, lobes 4, $\frac{1}{3}$ in., stamens and style as in the last species; capsule $\frac{1}{2}$ by $\frac{1}{5}$ in., stalk $\frac{1}{6}$ in. oblong, seeds many, minute, nearly round, finely netted.

Jaeschkea gentianoides, GENTIANACEÆ. F. B. I. iv. 119. Himalaya, Kashmir, 8-13,000 ft.

medium size, stiff, slender, slightly grooved; leaves $1\frac{1}{2}$ by $\frac{1}{4}$ in., narrowly lanceolate, sessile, bases shortly united; flowers $\frac{1}{4}$-$\frac{1}{2}$ in., blue, many, in branching racemes, calyx lobes 5, $\frac{1}{4}$ by $\frac{1}{20}$ in., lanceolate, short-pointed, nearly 3-striate, corolla $\frac{1}{6}$ enlarging to $\frac{1}{2}$ in., tubular, with a tendency to lateral bulging lobes 5, short, triangular-lanceolate, in fruit $\frac{1}{5}$ by $\frac{1}{6}$ in., stamens 5, on the bulge in the corolla tube, anthers blue or greenish, style linear-short, stigma 2-lobed; capsule $\frac{1}{3}$ in., oblong, with the ends rounded, flattened, very shortly stalked, seeds 10-30, $\frac{1}{20}$ in., much larger than in the last 11 species.

Jäeschkea latisepela, GENTIANACEÆ. F. B. I. iv. 119. Kashmir, 9-13,000 ft.

very like the last species, but with a thicker stem and broader leaves, sepals broader, even orbicular, and capsule sessile.

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LEAF MARGINS ENTIRE.

PETALS UNITED.

Pleurogyne carinthiaca, GENTIANACEÆ. F. B. I. iv. 119. Himalaya, Kashmir, 10-13,000 ft.

small, annual, branching from the base, radical leaves 1 by $\frac{1}{3}$ in., sometimes persistent, ovate, with a broad tip, stem leaves $\frac{1}{2}$ by $\frac{1}{4}$ in., ovate, narrowed at the base; flowers blue, $\frac{3}{4}$ in., on stalks $\frac{1}{4}$ by 2 in. long, calyx lobes 5, $\frac{1}{4}$-$\frac{1}{3}$ by $\frac{1}{8}$ in. blunt or very short-pointed, corolla tube very short, lobes $\frac{1}{2}$ by $\frac{1}{4}$ in., blue with green veins, fringed near the base, stamens 5, on corolla tube, filaments somewhat flattened, stigma sessile; capsule $\frac{1}{2}$ in., oblong, short-pointed, sessile, carpels separating, seeds very many, small, nearly round, smooth.

Pleurogyne spathulata GENTIANACEÆ. F. B. I. iv. 119. Kashmir, 13,000 ft. Lahoul (A. Kerner).

very like the last species, but the radical leaves are longer, linear narrowing from the broad tip to the base, the stem leaves are longer and narrower, and the corolla lobes are longer.

Swertia purpurascens, Chiretta, GENTIANACEÆ. F. B. I. iv. 121. Himalaya, 5-12,000 ft. Kashmir, Dalhousie, Dharamsala, Simla, Mashobra (Collett). Changlagalli, Murree (Douie).

medium size, annual, stem rounded or with 4 ridges, branched; leaves $1\frac{1}{2}$ by $\frac{1}{2}$ in., oblong or lanceolate, 3-1-nerved, lowest leaves blunt, uppermost short-pointed, smooth, base narrowed; flowers $\frac{1}{2}$ in. across, purple or dark-red, with a darker ring at the base of the corolla lobes, in branching leafy many flowered racemes, calyx-lobes barely united at the base, 5, $\frac{1}{6}$ in., oblong, one-nerved, corolla wheel-shaped, lobes 5, $\frac{1}{4}$ in., ovate, short-pointed, turned back, one horse-shoe-shaped naked depression or gland at the base of each lobe, stamens 5, dilated below into a tube, not united to the corolla, anthers long-pointed, style long, stigmas 2, nearly linear; capsule sessile, oblong, dividing into two, seeds many, $\frac{1}{50}$ in. diam., round, smooth, light yellow. This plant is used as a substitute for true *chiretta*, see below.

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LEAF MARGINS ENTIRE.

PETALS UNITED.

Swertia paniculata,
GENTIANACEÆ.
F. B. I. iv. 122.
Kashmir,
Himalaya, 5-8,000 ft.
Simla, Mashobra (Collett).

very like the last species, but the corolla-lobes are white in the upper half with two purple spots at the base forming a ring with gaps, one depression at the base of each lobe, ovate, naked, stamens united to the corolla and not joined into a tube, capsule long-pointed, seeds smaller.

Swertia tetragona,
GENTIANACEÆ.
F. B. I. iv. 122.
Himalaya, 5-8,000 ft.
Kashmir, Simla, Mashobra (Collett).

very like the last species, but stem more square, corolla lobes white with two hairy oblong glands on each lobe, no style, two stigmas consisting of two closely placed half round plates.

Swertia cordata,
GENTIANACEÆ.
F. B. I. iv. 123.
Himalaya, 4-12,000 ft.
Simla, Mashobra (Collett).
Kuldana near Murree (Donie).

medium size, annual, stem 4-ridged; leaves $1\frac{1}{4}$ by $\frac{3}{4}$ in., ovate, short-pointed, 5-3-nerved, base often heart-shaped, sessile; flowers $\frac{1}{2}$-$\frac{2}{3}$ in., yellowish-white, margin streaked with purple in many flowered branching racemes, calyx lobes $\frac{1}{3}$ by $\frac{1}{8}$ in., 5, ovate-lanceolate, short-pointed, barely united, corolla lobes 5, $\frac{1}{4}$-$\frac{1}{3}$ in. oblong, short-pointed or blunt, one large circular sticky naked yellowish spot at the base of each lobe, stamens 5, linear, hardly united at the base, style cylindric, stigmas 2 half round, capsule $\frac{1}{2}$ by $\frac{1}{5}$, often barely $\frac{1}{4}$ in., seeds $\frac{1}{25}$ in., nearly round, covered with raised rows of glands. In North Kashmir the flowers are often double.

Swertia chirata,
Chiretta,
Charayata.
GENTIANACEÆ.
F. B. I. iv. 124.
Himalaya, 4-10,000 ft.
Kashmir, Simla, Chadwick Falls, Mashobra, Matiana (Collett).
Jaku (Bomford).

medium size to large, annual, 4-ridged at the top, rounded below; leaves 2 by $\frac{3}{4}$ in., broadly lanceolate, lower often much larger and stalked, stem leaves nearly sessile, oblong, with rounded ends, short-pointed, 5-nerved; flowers bright green-yellow with purple nerves, nearly $\frac{3}{4}$ in. diameter, in large leafy many-flowered branching recemes, sessile or on short-clustered flower stalks, calyx lobes 4, $\frac{1}{6}$ in., lanceolate, distinctly united, corolla lobes 4, $\frac{1}{4}$ in.

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LEAF MARGINS ENTIRE.

PETALS UNITED.

ovate, long-pointed, two glandular depressions at the base of each lobe with a fringe of long white or pink hairs, stamens 4, linear, ununited, style cylindric, stigmas 2, oblong; capsule $\frac{1}{4}$ in, and more, ovate, short-pointed, seeds $\frac{1}{50}$ in., many-angled, smooth. This plant is exported to the plains and to Europe to supply a bitter tonic, more appreciated in India than in England.

Swertia alata,
Chiretta, hatmul, bui.
GENTIANACEÆ.
F. B. I. iv. 125.
Himalaya, 4-6,000 ft.
Kashmir, Simla above Lalpani, Naldera (Collett).
Dharampur.
Brogh (Bomford).

medium size, stem winged, branching, 4-angled when not winged; leaves $1\frac{3}{4}$ by $\frac{3}{4}$ in., ovate, short-pointed, 5-nerved, stem leaves nearly sessile; flowers $\frac{1}{2}$ in. across, bright green-yellow with purple veins in large leafy many-flowered branching racemes, one slit-like gland on each lobe, fringed covering a minutely velvety margined glandular depression, in other points very like the last species.

Swertia angustifolia,
Pahari kiretta.
GENTIANACEÆ.
F. B. I. iv. 125.
Himalaya, 2-7,000 ft.
East of the Chenab.
Simla, Mashobra (Collett).
Dharampur (Bomford).

medium size, 4-ridged or 4-winged; leaves $2\frac{1}{4}$ by $\frac{1}{4}$ in., linear-lanceolate, nearly 1-nerved, sessile, narrowed at the base, upper stem leaves barely stalked; flowers $\frac{1}{2}$ in. across, white or pale blue with darker dots in many flowered branching racemes, calyx lobes 4, barely united, $\frac{1}{2}$-$\frac{2}{3}$ in., oblong-linear, often longer than the corolla lobes sometimes shorter, corolla lobes $\frac{1}{4}$-$\frac{1}{3}$ in., 4, one large green circular naked depression partly covered by a scale, stamens 4, linear, anthers oblong, capsule $\frac{1}{3}$ by $\frac{1}{5}$ in., ovate, seeds $\frac{1}{40}$ in., many-angled glistening along the edges.

Swertia pulchella,
GENTIANACEÆ.
F. B. I. iv. 125.
Himalaya, 1-4,000 ft.
Kangra.

very like the last species, but leaves nearly 3-nerved, calyx lobes lanceolate much shorter than the corolla generally, corolla lobes ovate-lanceolate, the depression is smaller than in the last species.

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LEAF MARGINS ENTIRE.

PETALS UNITED.

Swertia speciosa, GENTIANACEÆ. F. B. I. iv. 128. Kashmir, Sonamerg, The Chor (Collett).

medium size to large, root stock perennial, stem annual, hollow, thick; radical leaves long stalked, stem leaves 5 by 2 in., ovate, 7-nerved, long-pointed, bases united, stem-clasping, tube at the base $\frac{1}{4}$-$\frac{1}{2}$ in., flowers $1\frac{1}{2}$ in. diam., bright grey in small branching narrow racemes on a short main stalk, calyx lobes 5, $\frac{1}{3}$ by $\frac{1}{6}$ in., ovate, short pointed, toothed, much overlapping at the base, corolla lobes 5, $\frac{3}{4}$ by $\frac{1}{5}$ in., oblong with a broad tip narrowed to the base, long-pointed, two glandular depressions at the base on each lobe nearly united, long-fringed stamens 5, linear, flattened, anthers ovate small, stigmas 2, nearly sessile; capsule $\frac{2}{3}$-$\frac{3}{4}$ by $\frac{1}{2}$ in., seeds $\frac{1}{8}$ in. diam., smooth.

Swertia petiolata, GENTIANACEÆ. F. B. I. iv. 128. Kashmir, 9-12,000 ft. Gulmerg, Tragbol.

medium size to large, rootstock perennial, stem annual, thick; radical leaves long stalked, lower stem leaves $3\frac{1}{2}$ by 1 in., oblong joined into a tube $\frac{1}{4}$-1 in., stalk 2-3 in., leaves at the base of the branched raceme $1\frac{1}{2}$ by $\frac{1}{2}$ in., sessile, hardly joined together, upper stem leaves stalked or sessile; flowers bright grey or nearly white with blue-green nerves, 1-$1\frac{1}{3}$ in. diam., in small 3-5-flowered branching racemes on main stalks $\frac{1}{2}$-$1\frac{1}{2}$ in. long, calyx lobes 5, $\frac{1}{3}$ by $\frac{1}{8}$ in. or $\frac{1}{2}$ by $\frac{1}{6}$ in., lanceolate short-pointed, corolla lobes 5, $\frac{1}{2}$ by $\frac{2}{3}$ by $\frac{1}{6}$-$\frac{1}{5}$ in., short-pointed with round glands or toothed with long glands, 2 glands yellow, depressed, much fringed on each lobe, stamens 5, style very short, stigmas short, capsule $\frac{1}{2}$ by $\frac{1}{4}$ in., seeds very rough with glandular ridges.

Swertia Thomsoni, GENTIANACEÆ. F. B. I. iv. 129. Kashmir, Sonamerg, 9,250 ft.

very like the last species, but sepals $\frac{1}{4}$ by $\frac{1}{10}$ in., short pointed, corolla lobes $\frac{1}{3}$ by $\frac{1}{6}$ in., nearly blunt, 2 yellow gland spots at the base of each lobe, not well defined, usually naked, rarely minutely hairy, capsule $\frac{1}{4}$ by $\frac{1}{8}$ in., seeds $\frac{1}{16}$-$\frac{1}{20}$ in., round, partly winged, smooth, glistening from a very minute network.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

Swertia cuneata, GENTIANACEÆ. F. B. I. iv. 129. Himalaya, 11-14,000 ft. — medium size, rootstock perennial, stem annual, hollow; leaves 3 by $\frac{3}{4}$ in., usually blunt, stem leaves oblong with a broad tip narrowed to the base or stalked; flowers blue, 1 in. diam. on long main stalks solitary or in 3-flowered clusters, each flower on a minor stalk $\frac{1}{4}$-2 in. long, calyx lobes barely united, $\frac{1}{4}$-$\frac{1}{2}$ in. narrowly oblong, blunt, short pointed or with a broad tip, narrowed to the base with a bristle at the tip, corolla lobes $\frac{1}{3}$-$\frac{1}{2}$ by $\frac{1}{8}$-$\frac{1}{6}$ in., blunt, 2 glands on each lobe fringed with hairs $\frac{1}{8}$ in. long or hardly any, glands linear vertical near the edge of each lobe, stigmas 2, half circular plates; capsule $\frac{1}{3}$ in., seeds blackish brown.

Swertia cœrulea, GENTIANACEÆ. F. B. I. iv. 129. Himalaya, 5-9,000 ft. Chamba (Clarke). Kagan (Barrett). — small, very like the last species, but the flowers are in a linear dense branching raceme on short main stalks, sepals narrowly lanceolate, corolla lobes rather longer, bright blue to purple with green veins, ovate, short pointed, glands small, oblong, with oblong small fringed scales, stigmas sessile, semi-circular; capsule larger narrowly oblong, seeds yellow-brown.

Halenia elliptica, GENTIANACEÆ. F. B. I. iv. 130. Himalaya, 6-12,000 ft. Kashmir, Mashobra, Mahasu, in woods (Collett). — small to medium size, stems 4-sided, angles narrowly winged; leaves 1-2 by $\frac{3}{4}$-$1\frac{1}{4}$ in., ovate, blunt, sessile, 5-nerved, stem leaves 1 by $\frac{1}{2}$ in., short-pointed, lower often stalked; flowers $\frac{1}{3}$ in. diam., pale blue axillary and forming a loose terminal branching raceme, calyx nearly split down to the base into four segments $\frac{1}{3}$ in., lanceolate, corolla bell-shaped, divided more than half way down into 4 lobes, a pit at the base of each lobe is prolonged into a hollow spur $\frac{1}{6}$-$\frac{1}{3}$ in. long, upturned, stamens 4, joined to the base of the corolla, style very short, cylindric, stigma 2-lobed, small; capsule $\frac{1}{3}$-$\frac{1}{2}$ in., sessile, ovate, splitting nearly to the base, seeds $\frac{1}{16}$ in. and more, fewer and larger than in most *Swertias*, smooth, yellow.

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LEAF MARGINS ENTIRE.

PETALS UNITED.

Trichodesma indicum, *Chhota kupha, kallri-buti, ratmandu, nila krai.* BORAGINACEÆ. F. B. I. iv. 153. The Plains to 5,000 ft. Valleys below Simla (Collett). Nurpur, Kangra, Rawalpindi, Hazara, and Choa Saidan Shah (Douie). Baluchistan (C. B. Clarke).

small, annual, rough with hairs on tubercles and elsewhere; leaves 1-4 in., sessile lanceolate, stem clasping, lower opposite, upper often alternate, short pointed; flowers $\frac{3}{4}$-1 in. across, pale blue turning to pink, then white, solitary on drooping axillary stalks, becoming terminal racemes by the lessening number of floral leaves, calyx $\frac{1}{3}$ in., conical, divided into 5 lobes, which are prolonged below into 5 recurved tails, lobes lanceolate, finely long-pointed, covered with grey or white silky hairs, corolla tube $\frac{1}{3}$ in., lobes $\frac{1}{3}$ in., ovate, abruptly tapering into a fine point, a yellow glandular spot at the base of each, stamens 5, short, woolly, anthers lanceolate, joining to form a woolly cone, tips bare, twisted, style terminal, not divided, stigma small; fruit oblong with rounded ends, 4-ridged, separating into 4 rough nutlets $\frac{1}{6}$ in.

Trichodesma africanum, BORAGINACEÆ. F. B. I. iv. 154. The Plains. Baluchistan (Boissier).

small, annual, very like the last, but rougher with stiff hairs, leaves ovate-oblong, long stalked, racemes generally lateral and dividing into two, flowers slightly smaller, nutlets with prominent margins fringed with barbed hairs.

STAMENS FOUR.

Buchnera hispida, see Herbs, Erect, Opposite, Exstipulate, Simple, Toothed.

STAMENS TWO.

Veronica Anagallis, Speedwell, SCROPHULARIACEÆ. F. B. I. iv. 293. The Plains to 9,000 ft. Valleys below Simla, Mashobra (Collett). Baluchistan (Lace).

medium size, perennial, nearly smooth, stem hollow; leaves 2-6 by $\frac{1}{3}$-$\frac{2}{3}$ in., oblong ovate, stem clasping; flowers blue or purplish, $\frac{1}{6}$-$\frac{1}{3}$ in. diam. in axillary racemes 3-6 ins. long, bracts shorter than the flower stalks, calyx 4-fid, segment $\frac{1}{16}$-$\frac{1}{4}$ in. long, corolla $\frac{1}{6}$-$\frac{1}{3}$ in. diam., 4-lobed, stamens 2, pink, style linear; capsule $\frac{1}{8}$-$\frac{1}{6}$ in. notched, flattened, seeds few, biconvex.

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LEAF MARGINS ENTIRE.

PETALS UNITED.

STAMENS TWO.

Veronica verna,
SCROPHULARIACEÆ.
F. B. I. iv. 296.
Himalaya, 5-7,000 ft.

small, stem slender, nearly smooth, sometimes branched from the base very leafy; leaves $\frac{1}{8}$-$\frac{1}{2}$ in. overlapping or the lower far apart, sessile, oblong, sometimes lobed; flowers small, blue, nearly sessile along the stem forming with the leaves a spike, calyx 4-fid, segments unequal, linear-lanceolate, corolla 4-lobed, shorter than the calyx, stamens two, style linear; capsule $\frac{1}{8}$ in. diam. indented above the base, narrow, keeled, seeds much flattened.

Veronica serpyllifolia,
SCROPHULARIACEÆ.
F. B. I. iv. 296.
Himalaya, 8-13,000 ft.
Narkanda (Collett).

small, smooth, or glandular velvety, branched from the base; leaves $\frac{1}{2}$-$\frac{3}{4}$ in. rather leathery, sessile, rounded or oblong floral leaves alternate; flowers white or blue in racemes 1-4 in. long; lower bracts leaf-like, upper narrow; calyx 4-fid, segments $\frac{1}{8}$-$\frac{1}{6}$ in. oblong with few hairs, shorter than the corolla, corolla $\frac{1}{4}$ in. diam., 4-lobed, stamens 2, style linear; capsule broadly heart-shaped, shorter than the calyx, seeds much flattened.

Barleria acanthoides,
ACANTHACEÆ.
F. B. I. iv. 484.
The Plains
Kirana Hill (Edgeworth).
Baluchistan (Boissier).

small, grey, prickly; leaves $1\frac{1}{4}$ by $\frac{1}{2}$ in. ovate with the tip rounded and broad almost sessile, bracts none, bracteoles 2, linear, spine tipped, rigid, often toothed, flowers white, $2\frac{1}{2}$ ins. long solitary or in crowded one-sided spikes, sepals 4 in two pairs, outer pair ovate, corolla $2\frac{1}{4}$ by $\frac{1}{8}$-$\frac{1}{6}$ in. nearly linear, lobes 5, nearly equal, ovate, stamens 2 and two aborted ones also, style long, capsule $\frac{2}{3}$ in., four-sided.

Barleria cristata,
Tadrelu, bansasigah.
ACANTHACEÆ.
F. B. I. 488.
The Plains to 6,000 ft.
Valleys below Simla (Collett).
Hazara (Douie).

large, hairy, branching; leaves 2-4 by 1 in., shortly stalked, ovate lanceolate, short pointed, flowers purplish blue or white, $1\frac{1}{4}$-$1\frac{1}{2}$ in. long in short crowded head-like, nearly sessile, axillary spikes, bracts none, bracteoles $\frac{1}{3}$-$\frac{2}{3}$ in. linear-lanceolate, toothed, sepals 4 in two pairs, outer sepals $\frac{3}{4}$ in. toothed, nearly spinous, corolla 5-lobed, $1\frac{1}{4}$-$1\frac{1}{2}$ in. long, lobes $\frac{1}{2}$ in., ovate, tube funnel-shaped

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

STAMENS TWO.

stamens 2, two aborted much smaller, style long, capsule $\frac{1}{2}$ in. oblong with a short point, seeds 4 or less, silky. The seeds are supposed to cure snake bite, the leaves and roots to reduce swelling.

COROLLA TWO-LIPPED.

STAMENS TWO.

Martynia diandra, see Herbs, Erect, Opposite, Exstipulate, Lobed.

Nelsonia campestris,
ACANTHACEÆ.
F. B. I. iv. 394.
The Plains, to 4,000 ft.

small, annual, woolly, with trailing flower stems 1-3 ft. long; leaves of the main stem 4-8 in. long, oblong with rounded ends, stalked, flowering stem-leaves nearly sessile, $\frac{1}{2}$-2 ins.; flowers $\frac{1}{5}$ in., purple or white, in crowded ovate or cylindric mostly sessile spikes $\frac{1}{2}$-2 ins. long, terminal on lateral branches, bracts $\frac{1}{6}$-$\frac{1}{4}$ in., ovate, blunt, woolly with glands, green, calyx $\frac{1}{8}$ in. green, marked with longitudinal lines, hairy or nearly papery, corolla $\frac{1}{6}$ in., tube slender, 2-lipped, lobes 5, blunt, spreading, stamens 2, attached above the middle of the tube, style 2-lobed; capsule $\frac{1}{6}$-$\frac{1}{5}$ in., oblong, short-pointed, seeds 8-12, yellowish with brown granular marks, ovoid with rounded ends.

Andrographis echiodes,
ACANTHACEÆ.
F. B. I. iv. 505.
The Plains.

small to medium size, annual, velvety and with spreading white hairs; leaves $2\frac{1}{2}$ by 1 in., oblong, blunt, sessile, base narrowed; flowers pink or white with purple, $\frac{1}{3}$-$\frac{1}{2}$ in., in dense hairy sticky axillary racemes about the length of the leaves on very short flower stalks, bracts small, bracteoles minute or none, calyx deeply 5-lobed, lobes $\frac{1}{6}$-$\frac{1}{4}$ in., linear, in fruit sometimes $\frac{1}{2}$ in., corolla $\frac{1}{3}$-$\frac{1}{2}$ in., tubular 2-lipped, white or pink with dark-purple lower lip, velvety, stamens 2, filaments hairy, anthers protruding, white bearded, style slender, minutely

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS TWO.

divided at the tip; capsule $\frac{1}{8}$ by $\frac{1}{6}$ in., short-pointed at both ends, oblong, 2 to 3 times as long as broad, seeds 6-12, bony, wrinkled, twice as long as broad.

Justicia betonica, ACANTHACEÆ. F. B. I. iv. 525. The Plains.

large, branches round, smooth, tips velvety; leaves 4-1$\frac{3}{4}$ in., ovate-lanceolate, dotted on both surfaces, leaf stalk $\frac{1}{8}$ in.; flowers $\frac{1}{2}$ in. long, white, with rose spots, on short-stalked continuous usually terminal spikes, bracts $\frac{2}{3}$-$\frac{1}{3}$ in., white with green nerves, ovate, short-pointed, bracteoles $\frac{1}{3}$-$\frac{1}{2}$ in., like the bracts, calyx 5-segmented, segments $\frac{1}{6}$ in., linear-lanceolate, velvety, corolla 2-lipped, upper lip 2-lobed, lower 3-lobed, stamens 2, anthers 2-celled, lower cell white tailed, style bifid, thread-like; capsule $\frac{2}{3}$ in., club-shaped, velvety, 4-seeded, seeds ovoid, somewhat flattened, smooth.

Justicia heterocarpa, ACANTHACEÆ. F. B. I. iv. 531. The Plains. Ferozepore (Vicary).

small, covered with minute grey velvety down; leaves 1 by $\frac{1}{2}$ in., ovate, with minute lines nearly smooth, stalk $\frac{1}{8}$ in.; flowers minute, solitary to four together, axillary, bracts and bracteoles small, linear, calyx divided into 5, segments $\frac{1}{8}$ in., linear, minutely velvety, corolla $\frac{1}{6}$ in., 2-lipped, upper lip shortly 2-lobed, lower lip shortly 3-lobed, transversely marked, stamens 2, anthers ovate, lower part white tailed, style filiform, bifid; capsules of two kinds in nearly every axil, normal capsule $\frac{1}{8}$-$\frac{1}{6}$ in., oblong, ends rounded, short-pointed, scarcely stalked, velvety, 4-seeded, abnormal capsule winged, crested, one-seeded, seeds in normal capsules rough, almost hairy, in abnormal capsules the one seed is larger and smooth.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS TWO.

Justicia pubigera, ACANTHACEÆ. F. B. I. iv. 536. Himalayas, 4-7,000 ft. Simla (Collett).

large, stems round, hairy; leaves $2\frac{3}{4}$-$1\frac{1}{4}$ in., shortly stalked, ovate-lanceolate, hairy on both surfaces, long-pointed; flowers purplish-red in axillary, stiff, loose clusters, forming terminal leafy branching erect racemes, bracts $\frac{1}{8}$-$\frac{1}{6}$ in., linear, bracteoles none or minute, calyx 5-parted, segments $\frac{1}{3}$ in., linear, velvety, corolla $\frac{2}{3}$ in. long, velvety, straight, tubular, 2-lipped, lower lip $\frac{1}{3}$ in. long, 3-lobed, recurved, upper lip erect notched, stamens 2, anther-cells distinct, upper blunt, lower white tailed, style minutely 2-lobed; capsule $\frac{1}{2}$ in., velvety, stalked, seeds 4 or less.

Justicia diffusa, ACANTHACEÆ. F. B. I. iv. 538. Himalayas, to 3,000 ft.

small, stems 4-angled, smooth or minutely velvety; leaves $3\frac{1}{4}$-$4\frac{1}{4}$ ins., oblong, long-pointed at both ends, stalk $\frac{1}{4}$ in., somewhat hairy; flower $\frac{1}{4}$ in., in slightly hairy slender terminal or axillary spikes, bracts $\frac{1}{6}$ in., linear shorter than the calyx, bracteoles $\frac{1}{10}$-$\frac{1}{8}$ in., lanceolate, calyx 5-segmented, segments $\frac{1}{6}$ in., like the bracts, lanceolate, minutely hairy above, stamens 2, style like the last species; capsule $\frac{1}{8}$-$\frac{1}{6}$ in., 4-seeded.

Justicia simplex, ACANTHACEÆ. F. B. I. iv. 539. Himalayas, to 7,000 ft. Simla (Collett).

small, hairy, branched, grooved; leaves 1-$1\frac{1}{4}$ in., ovate or lanceolate, short-pointed, hairy, shortly stalked; flowers small, pale purple, crowded in densely hairy cylindric spikes $\frac{3}{4}$-1 in. long, terminal or axillary, bracts as long as the calyx, green-keeled, very hairy, short-pointed, lanceolate, bracteoles hairy, linear, calyx 4-segmented, segments hairy, lanceolate; corolla $\frac{1}{5}$ in., 2-lipped, upper lip erect, narrow, notched, lower wider, 3-lobed, stamens and style as in the last species; capsule $\frac{1}{8}$ in.

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HERBS, ERECT WITH OPPOSITE EXSTIPUTATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS TWO.

Dicliptera Roxburghiana, Var. bupleuroides, *Kirch, somni.*
ACANTHACEÆ.
F. B. I. iv. 553.
The Plains, to 6,000 ft.
Simla (Collett).
Common in the hilly districts of the area.

large, hairy, loosely spreading, stems grooved; leaves 2-5 by $\frac{3}{4}$-$2\frac{3}{4}$ ins., long-pointed, ovate-lanceolate, stalked, somewhat velvety; flowers pink, spotted with purple, or white crowded in axillary clusters towards the ends of branches, bracts $\frac{1}{2}$ by $\frac{1}{5}$ in., often 3-nerved, long-pointed, bracteoles linear, calyx 5-parted, segments linear, corolla velvety, $\frac{3}{4}$ in. long, tube cylindric, twisted, limb 2-lipped, upper lip erect, notched, lower recurved, 3-toothed, stamens 2, anther-cells blunt, style minutely 2-lobed; capsule $\frac{1}{4}$ in., 2-celled, winged, seeds 4, warted.

Peristrophe bicalyculata, *Atri lal.*
ACANTHACEÆ.
F. B. I. iv. 554.
The Plains.

small, spreading, hairy; leaves 2 by 1 in., ovate, long-pointed, leaf stalk $\frac{1}{4}$ in.; flowers rose or purple in axillary or terminal clusters, bracts 1-4 together, linear, short-pointed, $\frac{1}{3}$ in. long, long-stalked, calyx deeply 5-lobed, segments equal, linear, lanceolate; corolla $\frac{1}{3}$-$\frac{1}{2}$ in., tube slender, deeply 2-lipped, upper lip hardly notched, lower shortly 3-lobed; stamens 2, anthers ovoid, style thread-like, minutely 2-cleft; capsule $\frac{1}{3}$-$\frac{1}{2}$ in., seeds 4, flattened, covered with minute papillæ.

(To be continued.)

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REVIEW.

CATALOGUE OF THE LEPIDOPTERA PHALÆNÆ IN THE BRITISH MUSEUM.

Volume IX.

BY

Sir George F. Hampson, Bart.

The ninth volume of Sir George Hampson's Catalogue of the Moths of the World concludes the survey of the species belonging to the Noctuid Subfamily Acronyctinæ and deals with 725 species belonging to 185 genera, these numbers including a few additions to Volumes VII and VIII which dealt with the earlier groups of this Subfamily.

It need hardly be said that a complete survey, such as this is, of the entire literature and inter-relations of a whole group of species is of inestimable benefit to every lepidopterist who has to deal with any species contained in the group, whatever his particular line of study, although only those who have groped their way through the tangled jungle of synonymy can have any idea of the vast amount of labour entailed in the preparation of a work of this nature.

When it is stated that the key to the Acronyctine genera alone occupies 17 pages, some idea can be formed of the magnitude of the scale on which this catalogue is being produced. It may be noted, *en passant*, that this key to the genera is founded almost wholly on structural differences of tarsal and tibial spines, development of proboscis, presence of an areole, etc., and scarcely at all on neurational characters, which last are scarcely so reliable since they are sometimes subject to variation; for example, on comparison of a specimen of *Mudaria cornifrons* with the description and figure on page 226 of this volume, we find that in this particular individual veins 3 and 4 and 6 and 7 of the hindwing are distinctly stalked, although normally they are emitted from the two angles of the cell.

Sir George Hampson has so made himself our first and foremost specialist in the Noctuidæ that criticism of his arrangement and general treatment of the family appears unnecessary. But there is one small point which we may bring forward and the more especially so because it is a matter which affects the whole range of nature to which the binomial system of nomenclature is applicable. We hold that a name, once applied to a genus or species, is inviolable (except of course in the case of an adjectival word used as a specific name, when the termination may be made to agree with the gender of the name of the genus in which the species is placed, or in the case of an obvious misprint for which there is evidence) and should not

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be changed from its orginal spelling. The language of entomological nomenclature is Latin, a language which is used by common consent as a kind of neutral ground whereon entomologists of every race or dialect may meet on equal terms; entomological Latin (in common with the Latin of other branches of science) is often bad, we readily admit, and may often and does often degenerate into the school boy or canine variety—we recollect a recent case in the Transactions of a leading Society where an author wrote a paper on the early stages of certain moths and called their eggs "ovæ" throughout his paper!—but it fulfils its object by providing a vehicle of expression which is mutually understood by all who use it, and it appears unnecessarily pedantic to insist too much on the strict letter of the law and to claim that Latin of the Augustan epoch, and of no other period, is to be accepted. Latin may be technically a "dead" language, but we submit that it is capable of expansion—nay, more, it has expanded —in its vocabulary since the days of Augustus. This being so, it is an unnecessary source of confusion to alter the spelling of well-known names merely because they contain a letter which Horace might not have recognised. In this volume, however, a name such as "*jankowskii*" becomes "*jancousci*" and "*howardi*" becomes "*houardi*" (this latter a particularly objectionable change), whilst names like "*hilzingeri*" and "*schlumbergeri*" are allowed to persist unchanged; we wonder which Horace would rather have had to pronounce! If *Cephonodes kingi* is to be changed to *C. cingi* why not go further and alter its name to *C. regis*?

Another point to which we can only refer very briefly is the instability of nomenclature caused by the alteration of well-known names under a system by which the Law of Priority is invoked to sanction the resuscitation of some unfamiliar name unearthed from the musty records of the past. We are glad to note that the Zoological Society is taking steps to protect well-recognised names in general use. The student will note in the present volume that the familiar *Nonagria* has become *Sesamia*, the well-known *Nonagria uniformis* being now called *Sesamia uniformis*.

As regards the genera and species with which we are more immediately concerned, the following list gives all those occurring within the limits of the Indian Region.

† Means figured by text-block.

‡ ,, figured in atlas of coloured plates.

* ,, new genus or species.

† 4312 .. Lophotyna*	.. albirena, Moore.	.. 1724	.. Sikhim; Bengal.
† 4318 .. Gortyna	.. leucostigma, Hb.	.. 1795	.. ? Khasis.
4351 .. Hydræcia	.. basalipunctata, Grs.	.. 1594	.. Khasis.
4357 .. Pyrrhia	.. umbra, Hufn.	.. 1598	.. Kashmir; Punjab; Khasis.
† 4359 .. Callœcia*	.. swinhoei, Butl.	.. 2025	.. Bombay.
† 4441 .. Cytocanis*	.. denticulosa, Wlk.	.. 2016	.. Bombay; Madras.
† 4505 .. Elydna	.. bosca, Swinh.	.. 1885	.. Burma.

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4506	Elydna	plagiata, Wlk.	1886	Punjab; Bombay; Ceylon; Burma.
† 4512	,,	reclusa, Wlk.	875	Bombay; Madras; Ceylon.
† 4513	,,	erigida, Swinh.	938	Travancore; Burma.
† 4514	,,	bipuncta, Snell.	1874a 1877 (pt.).	Punjab; Sikhim; Khasis.
4516	,,	lineosa, Moore	1877 (part).	Punjab (Kulu; Dalhousie).
† 4517	,,	truncipennis*		Punjab: Sikhim; Khasis; Ceylon.
‡ 4518	,,	ochreipuncta, Hmpsn.	1869	Sikhim.
4521	,,	renalis, Moore	1878	Ceylon.
‡ 4523	,,	rectilinea*		Punjab (Kulu; Sultanpur; Dalhousie).
‡ 4524	,,	bisignata, Hmpsn.	2058a	Madras.
‡ 4527	,,	atripuncta*		Ceylon.
‡ 4528	,,	ochracea, Hmpsn.	2058	Burma.
† 4530	,,	transversa, Wlk.	2057	Bombay; Ceylon; Burma.
† 4536	Androlymnia*	emarginata, Hmpsn.	2098	Simla; Nilgiris; Ceylon.
† 4539	Nikara	castanea, Mo.	1792	Sikhim.
† 4540	Apocalymnia*	tenebrosa, Hmpsn.	1874b	Madras (Cuddapah; Horsley Konda).
4543	Calymnia	restituta, Wlk.	2055	Punjab; Nepal.
‡ 4549	,,	flavifimbria,*	2056 (part).	Kashmir; Punjab (Note C affinis to be deleted from Indian List).
‡ 4551	,,	ochreimargo, Hmpsn.	1873	Punjab; Sikhim.
† 4575	Basilica*	chrysosticta, Hmpsn.	2689a	Bombay.
† 4600	Mudaria	cornifrons, Mo.	1825	Bengal.
‡ 4658	Phragmatiphila*	fumea, Hmpsn.	1798a	Sikhim (1800′).
‡ 4659	,,	leucaneura*		Burma.
‡ 4660	,,	grisescens*		Sikhim (1800′).
‡ 4672	Calamistis*	microsticta, Hmpsn.	1793	Sikhim.
† 4673	,,	submarginalis, Hmpsn.	1946	Nilgiris.
† 4676	Rabila	frontalis, Wlk.	1591	Ceylon.
‡ 4689	Arenostola*	procera, Stdgr.		Kashmir.
† 4700	Sphetta	apicalis, Wlk.	1585	Bombay; Ceylon.
† 4737	Acrapex	acuminata, Hmpsn.	1954	Nilgiris.
4739	,,	hamulifera, Hmpsn.	1952	Ceylon.
‡ 4742	,,	brunnea*		Ceylon (Maskeliya).
‡ 4744	,,	atriceps*		Khasis.
‡ 4745	,,	leucophlebia, Hmpsn.	1953	Nilgiris; Travancore.
† 4746	,,	prisca, Wlk.	1951	Travancore; Ceylon.
‡ 4748	,,	roseotincta*		Ceylon (Maskeliya).
† 4756	Sesamia	pallida, Butl.	1950	Bombay (Mhow).
† 4759	,,	inferens, Wlk.	1943 (part).	Bengal; Assam; Madras Ceylon; Burma; Andamans.
† 4766	,,	cretica, Led.	1943 (part).	Punjab (Dharmsala); Sikhim (1800′).
‡ 4767	,,	uniformis, Ddgn.		Bengal; Bombay.
‡ 4773	Xylostola*	robusta, Hmpsn.	1945	Sikhim; Khasis.
† 4774	,,	indistincta, Mo.	1889	Sikhim; Nilgiris; Ceylon.
† 4777	Arcilasisa	sobria, Wlk.	1939	Punjab; Nepal; Sikhim; ? S. India.
† 4782	Clethrorasa*	pilcheri, Hmpsn.	1960a	Sikhim (5000′).
† 4785	Apsarasa	radians, Westw.	1962	Sikhim; Assam.
‡ 4786	,,	figurata, Mo.	1962 (part).	Andamans.

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† 4794 .. Chasmina	.. sericea, Hmpsn.	.. 1957	.. Ceylon; Burma.
† 4796 .. ,,	.. tibialis, Fb.	.. 1958	.. Punjab (Jubbulpore, Dehra Dun; Sikhim; Nilgiris; Ceylon.
4799 .. ,,	.. judicata, Wlk.	.. 1959	.. Punjab (Jubbulpore); Rajputana; Nilgiris; Ceylon.
4800 .. ,,	.. rejecta, Fb.	.. 1960	.. Punjab (Jubbulpore); Madras; (Nilgiris, Travancore, Trevandrum); Ceylon; Burma; Nicobars.
‡ 4802 .. ,,	.. maculata, Hmpsn.	.. 1961	.. Burma
† 4807 .. Callyna	.. siderea, Gn.	.. 2169	.. Punjab (Almora, Dharmsala, Allahabad); Nepal; Khasis; Bombay (Poona); Ceylon.
4809 .. ,,	.. costiplaga, Mo.	.. 2173	.. Bombay; Nilgiris; Ceylon.
4812 .. ,,	.. jugaria, Wlk.	.. 2171	.. Punjab (Dehra Dun, Manpuri); Sikhim; Bengal; Ceylon. Andamans.
4813 .. ,,	.. semivitta, Mo.	.. 2171 (part).	Punjab (Kulu); Sikhim.
‡ 4814 .. ,,	.. mystica, Wlk.	.. 2172	.. Burma.
4816 .. ,,	.. monoleuca, Wlk.	.. 2170	.. Sikhim; Assam; Bombay (Kanara Karwar); Nilgiris; Ceylon (Trincomali); Burma; Nicobars.
† 4902 .. Seudyra	.. venosa, Mo.	.. 1571	.. Punjab (Almora); Sikhim Bengal.
† 4905 .. ,,	.. longipennis, Wlk.	.. 1572	.. Sikhim; Silhet.
4906 .. ,,	.. catocalina, Wlk.	.. 1573	.. Sikhim.
‡ 4909 .. ,,	.. bala, Mo.	.. 1570	.. Sikhim (7,000-10,000).
† 4911 .. ,,	.. transiens, Wlk.	.. 1569	.. Sikhim; Assam; Burma.
† 4913 .. ,,	.. albifascia, Wlk.	.. 1574	.. Sikhim; Bombay (Kanara); Burma.
4914 .. ? ,,	.. nepcha, Mo.	.. 1575	.. Sikhim.
† 4917 .. Protoscudyra*	.. picta, Hmpsn.	.. 1872	.. Sikhim; Khasis.
† 4920 .. Opsyra*	.. chalcoela, Hmpsn.	.. 2174*a*	.. Sikhim (5,000-10,000').
‡ 4932 .. Micrapatetis	.. pyrastis*	..	.. Madras (Gooty).
‡ 4933 .. ,,	.. flavipars*	..	.. Bombay.
† 4986 .. Hypocalamia*	.. meterythra, Hmpsn.	.. 1709	.. Punjab (Murree).

The following are Corrections and Additions to Volumes VII and VIII of the Catalogue :—

Vol. VII.

2864*a*.. Trachea	.. confluens, Mo.	.. 1753	.. Sikhim.
2894 .. ,,	.. monilis, Mo.	.. 1835	..
3378*a*.. Oroplexia	.. simulata, Mo.	.. 1776	.. Sikhim.
† 3452*a*.. Pachylepis	.. dilectissima, Wlk.	.. 2109	.. N. E. Bengal; Nilgiris; Ceylon; Burma.
† 3452*b*.. Xantholepis*	.. dicycla, Wlk.	.. 2110	.. N. India; Burma.
† 3457*a*.. Pœcilogramma	.. albiscripta, Hmpsn.	.. 2139*a*	.. Khasis; Bombay (Kanara, Karwar); Nilgiris; Ceylon (Maskeliya).
3553 .. Pariambia	.. pulla, Swinh.	.. 2089	.. Punjab (Simla, Campbellpur, Dharmsala, Cawnpur); Bengal (Calcutta); Bombay (Deesa, Poona); Ceylon (Wellawaya).

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3553*a*..	Pariamtra	.. unduligera, Butl.	.. 2078	.. Punjab (Dharmsala) Madras (Belgaum).
Vol. VIII				
3887*a*..	Antha	.. rotunda, Hmpsn.	.. 2191*a*	..Sikhim.

[T. B. F.]

The number *preceding* each species is its number in the present Catalogue; the number *following* each species is its number in the old arrangement followed in the "Fauna of India" volumes.

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THE SHOOTING SEASON, 1908-1909

BY

N. B. KINNEAR.

In the spring of 1909 the Honorary Secretary sent out with No. 1, Vol. XIX, of the Journal a form on which members were requested to fill in the results of the past Small Game Shooting Season. Owing to unavoidable delays the report has not been published earlier, but it is hoped that when the forms, which are being sent out with the present Number, are returned there will not be such a delay in reporting on them.

Twenty-eight returns relating to some thirty districts have been sent in, and we are specially grateful to Col. Waller Barrow, R.A.M.C., for obtaining a number of reports from Officers stationed chiefly in the N.-W., without which this report would hardly have been worth publishing.

The information asked for in the forms was unfortunately too brief, and a mistake was made in not making the forms larger, as there was barely room for the information asked for; this, however, is being remedied in the Schedules sent out with the present issue.

Before giving some details as to the various districts, it may be as well to mention briefly what the rainfall was like in different parts of the country. According to the Indian Weather Reveiw of the Annual Summary there was an abnormal rainfall in the N.-W., it being the largest departure from the normal since 1875, *i. e.* + 8·75 as compared with + 6·74 in that year.

In the East part of Central India, the greater part of the C. P., Hyderabad South and Malabar, the rainfall was all above normal, and in Rajputana West there was nearly 15″ more rain than the normal supply. In the Bombay Deccan, Central India West, Mysore, and Madras South-East the fall was below normal, but nowhere was the deficit more than 11 per cent. Through Eastern Bengal, Behar and the East of the United Provinces there was a deficit of over 20 per cent., but in the Bay Islands and Orissa there was an excess of about 20 per cent. In Assam the fall was slightly below the average, but in Burma it was a little above.

QUAIL.

Quail appear to have been fairly good in the Gurdaspur district, especially at Bakloh, Ajmer, Etah, Sita Road, Nasirabad, Neemuch, Deesa, Bhandara, Aurangabad and in the Bahraich district in Oudh, though bad in the adjoining district of Gonda. From Dera Ismail Khan, Multan, Abu Road, Gonda district, Champarum and Dharwar, the returns are not good, the last-named being "very bad." Apparently the reason for quail being in small numbers at such places as Dera Ismail Khan, Multan and Abu Road was the excessive amount of water about and the sodden condition of the ground at the time of the southward migration, which was no inducement

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BOMBAY NATURAL

SMALL GAME SHOOTI

Will Members kindly send in their experiences with regard to the above season. It Members will either fill in the Schedule themselves or hand it on to a friend. For instructio

DISTRICT .....

RAINS DURING THE MONSOON .....

KIND OF S

GEESE.	DUCK.	

DETAILS O

GEESE.	DUCK.

INSTRUCTIONS FOR FILLING IN SCHEDULE.—*District*—The exact locality is not wanted whether the rains were normal, or above or below normal. *Type of Season*—In the column under this hea below average, as compared with previous years. Under *Details of Bags* the number and the kinds of th be taken under this or the "Type of Season" not to mix bags made in different Districts widely sep ducks, geese, snipe and quail may be recorded in the Remarks column ; also any other information of int always be of interest. All returns should be sent in to the Society by 31st May 1911.

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for the birds to stop. At first sight one would have imagined the same conditions existed at Ajmer where quail were "abundant in places," since we know there was a very heavy rainfall and "the tanks were full to overflowing." On looking at the rainfall returns, however, we find that for the month of September the fall was below the average and so the ground may have had time to dry and be suitable to quail "in places."

SNIPE.

Snipe were reported as being (1) "very good", "good" or "plentiful" in the Gurdaspur and Kangra districts, at Dera Ismail Khan, Mahi Kantha, Champarum, Cuddapah, Sonapur and the Andamans; (2) "fair" or "average" at Sita Road, Nasirabad, Neemuch, Deesa, Etah, Bhandara, Aurangabad and Dharwar; (3) "scarce" or "bad" at Phillour, Multan, Seistan, Ajmer, Abu Road, Bahraich and Gonda Districts, Balaur, Mysore, Manipur and Lower Bengal.

Comparing these reports with the rainfall in the districts we find that there was an average fall in all those which come under (1) except at Champarum in Bengal, where it was below the average. There, however, the snipe were frequenting the semi-dry beds of large jheels in perfect security since it was impossible to get near them. In the districts under (2) the rainfall was either above or a little below the normal, but in those which come under (3) all kinds of rainfalls were experienced: for instance, at Ajmer and Abu Road there was an abnormally heavy fall, while in the Gonda and Bahraich districts of Oudh the fall was much below tne average.

In the Andamans snipe arrived in the beginning of September and nothing but pintails were shot. The first snipe to be seen and shot in the Bhandara district was a pintail on October 9th.

DUCK AND GEESE.

Taken as a whole, the season seems to have been bad all over except in the N.-W., Assam and one or two isolated localities. In the Gurdaspur and Kangra districts the season was a good one and quite up to the average, and at Dharwar in the Southern Mahratta Country certain kinds of ducks were very abundant. According to Lieut.-Colonel Impey birds were unusually abundant on the famous Bharatpur Jhil in Rajputana (J. B. N. H. S., Vol. XIX, pp. 750-1), while in Lower Bengal they were more numerous than usual, and at Sonapur in Assam the season was very good. The returns from Nasirabad, Neemuch and Deesa give the season as an average one with plenty of duck about, and those from Dera Ismail Khan, Etah and Manipur give it as "fair." The remaining localities which include Phillour, Multan, Sita Road, Ajmer, Abu Road, Bahraich and Gonda districts, Champarum, Bhandara, Aurangabad, Balur, Bangalore, Cuddapah and Mysore are returned as "bad" or "very bad."

It is difficult to account for the scarcity of duck in parts of Sind,

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Rajputana, Oudh and the Peninsula since in many places where they were scarce the rainfall was not far below the average. The excessive rain and overflowing tanks at Ajmer and Abu Road and the want of rain and the drying up of the tanks in the Gonda and Bahraich districts are the two extreme conditions which ducks do not like, hence their absence. In what way, however, can we account for the absence of duck in Mahi Kantha, where the rainfall was about normal and there were plenty of snipe, which shows there was no scarcity of water? In Lower Bengal the rains were bad, but nevertheless duck were more numerous than usual.

With so few returns at our disposal, it is very difficult to attempt to give any reason for the season being bad as a whole, since the rainfall appears to have been up to the average leaving out Rajputana and Oudh. Probably the distribution of rain during the monsoon and an examination of the rainfall returns for previous years might help to explain matters, but with so few returns it would be impossible to make any safe deductions.

Coming now to geese, it is rather interesting to find that there were "rather more than usual" at Ajmer where it will be remembered there was a great deal of water but no duck. At Sita Road and Ghaziabad the season for geese was good, but at both these places duck were said to be very bad. The remaining returns show that at Dera Ismail Khan, Etah and Manipur the season was good or fair, while at Sonapur it was reported as being very good for Bar-headed Geese.

As an instance how a district may vary or how differently people may judge the season, it is worth mentioning that out of the four returns for the Gurdaspur district, three give the season as good for duck, while the fourth says "very scarce"; and it is remarked that they "had not come in by the 15th November," while in one of the other returns they are said to have begun to come in between the 15th and 20th October. The only other districts in which the arrival of duck is mentioned are Bhandara in the C. P., where the first duck to be seen was a gadwall on October 29th; Neemuch, where Lieut. Logan Home shot a garganey and a common teal out of a flock of four on 18th October and remarks:—"These were the first of the year to be seen here" and in the Champarum district of Bengal where a flock of garganey appeared on May 20th. Colonel Impey in the Journal mentions that the first arrivals noticed on the Bharatpur Jhil were garganeys which arrived on the 15th August. By the end of November the garganey had been replaced by the common teal, but they returned again in February, some remaining till April.

If more details of bags are given in the next returns, the comparison of the distribution of the different kinds of duck would be most interesting. As it is, there are few details in the present returns, but some of these are of interest and may be worth mentioning.

At Dera Ismail Khan mallard were in good numbers, gadwalls fair,

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pochards scarce, and the white-eye the only kind at all well represented. Pintail and teal were also scarce and not a single spot bill was seen, though Lieut. Francis says "I spent many days of the cold weather boating on the Indus, yet I never came across a single spot bill."

At Sita Road, where the season was a bad one, pintail were especially scarce and at Etah there were fewer mallard and more gadwall than in the previous season. White-eye were also more numerous. In the Champarum district, Bengal, white-eye and tufted duck were unusually numerous. Spot bill and cotton teal were very good and teal good at Dharwar, but the other varieties were scarce. Marbled duck were very numerous at Seistan and one was shot at Bharatpur. In Manipur State Colonel Shakespear reports that Mr. W. A. Cotgrave shot a pink-headed duck in November 1908 and another was recorded in the Journal Vol. XIX., p. 264, by Mr. E. R. Jardine from Koolay, Upper Burma, shot in December 1908. In the same Journal, Lieut. W. R. C. Tennison, R.A., mentions shooting two stiff-tailed ducks near Nowshera.

We are indebted to the following members and others for sending in Shooting Season returns :—

Col. W. G. Walker, (Kangra Valley); Major G. H. Frost, I.M.S., (Gurdaspur Dist.); Capt. A. M. Rundall, (Gurdaspur Dist.); Capt. R. J. Bradley, (Gurdaspur Dist.); Lt. H. L. Scott, (Kangra and Gurdaspur Dist.); Lt. R. B. Phayre, (Gurdaspur Dist., Phillour and Ghaziabad); Major R. C. Kennion, (Seistan); Lt. R. F. Francis, (Dera Ismail Khan); Lt. N. Mosley, (Multan and Sita Road); Lt. W. M. Logan Home, (Nasirabad, Neemuch and Deesa); Mr. E. H. Young, (Ajmer); Mr. R. Whately, (Abu Road); Major E. O'Brien, (Mahi Kantha); Mr. O. O'Donnell, (Bahraich and Gonda Districts); Mr. W. B. Cotton, I.C.S., (Etah); Mr. J. S. E. Walker, (Ghorasan); Major H. R. Baker, (Cannanore; Mr. C. W. M. Hudson, I.C.S., (Dharwar); Mr. E. Lund, (Balur); Lt. C. D. Gregson, (Bangalore); Major H. P. Ainslie, (Cuddapah and Mysore); Mr. L. W. Middleton, (Sonapur, Assam); Lt.-Col. J. Shakespear, (Imphal, Manipur); Mr. W. T. Page, (Lower Bengal); Mr. P. F. Wickham, (Andamans).

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MISCELLANEOUS NOTES.

No. I.—FOOD OF THE HOOLOCK OR WHITE-BROWED GIBBON.

It may interest you to know that a tame Hoolock *(Hylobates hoolock)*, about 8 years old, kept by a friend of mine, ate some time ago two seed capsules with the seeds of the common Datura (*D. alba*) with apparent relish and without any visible ill-effects; it is surely strange that a poison so virulent to man does not affect an anthropoid ape?

J. C. H. MITCHELL.

TEZPUR, ASSAM, *8th April*, 1910.

[Dr. A. Powell to whom we have referred the above case writes as follows:—

"Dhatura is not a 'virulent' poison to man. It is mostly given by criminals with the intention not of murdering but of facilitating robbery while the victim is in a state of deep narcotic sleep. The vast majority of cases recover.

Rabbits, apes and monkeys are scarcely affected, even by enormous doses of Dhatura or Belladonna. 'One animal's meat is another's poison.' As a whole, carnivorous are more sensitive than herbivorous animals to the common poisons. Thus, monkeys and fowls are unaffected by doses of strychnine that would kill a pack of hounds. Pigeons thrive on an exclusive diet of poppy seeds, and I doubt if they could be poisoned by the largest doses of opium."—EDS.]

No. II.—VITALITY OF A TIGER.

Recently I had a very striking example of the extraordinary vitality of a tiger. I got "khubber" of a kill and went to the place which was in a patch of thatching grass on the top of a hill. While I was looking at the kill the Tiger came out of the grass. I could only see his face at which I fired using a ·500 bore H. V. rifle, 80 grs. cordite, 576 grs. bullet. He went over to the shot and lay on his back with the blood bubbling out of his nose where the bullet had struck him. Thinking him dead and not wishing to spoil the skin with another shot, I went off to send the elephant to have him carried in. On our return about an hour later, he was not there, but from the blood traces it was clear he had rolled into the adjoining nullah. As it was late in the evening we postponed looking for him till next day, but, although we found where he had lain all night and even put him up, I could not get him. Some days after some Nagas brought me a chip of bone which appeared to be a portion of a jaw with a fragment of a molar which they said they had found in the jungle in a mass of fly blown pus at a spot where the tiger had been lying up.

Seven weeks later I got "khubber" of several kills of goats and finally of a young heifer. I went to this last kill, and found the beast badly clawed about the head with some very superficial punctures in the neck. I put it down to a leopard and tied up a goat. In a few minutes a tiger came out and I killed him with a ·303 bullet in the brain. When skinning the tiger,

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I found the septum of the nose divided but healed and a hole through the nasal orifice slantwise to the joint of the left lower jaw. The joint was fractured and the pieces had come away, but instead a new muscular growth had formed which held the broken end of the lower jaw-bone to the joint. The tiger was in a famished condition, and it was abundantly clear that it was the same beast I had shot and lost seven weeks before.

W. J. H. BALLANTINE.

HAFLONG, NORTH CACHAR HILLS, 8*th May* 1910.

No. III.—PANTHER FOUND AWAY FROM ITS USUAL HAUNTS.

The following may perhaps interest your readers. Late in the afternoon of the 4th instant a "shikari" came to tell me that a panther was surrounded by 60 villagers, about 3 miles from the Cantonment of Ahmedabad. I left at once but the 3 miles proved to be considerably more, and I only reached the village near which the panther had been seen by the "shikari" to find that it had been killed by the villagers who were determined not to lose the chance of getting the reward for his skin. The next morning they brought the dead body on a cart and obtained the Government reward, selling the dead beast as he lay to a native skin-dresser for Rs. 3. The skin, I may add, was much damaged, for the poor beast had been driven about from 11 A.M. to 6 P.M., from field to field, without any water, and when quite exhausted clubbed to death with lathies; a couple of the more plucky villagers rushing in as leaders. It is not often that panthers are to be found in neighbourhoods, such as this part of Guzerat; and this beast (a fine male) must have strayed from the Hills near "Idar" some 50 miles to the East.

This is the second time, however, that I have known a panther straying a long distance, from any cover, for in 1904 at Sirsa in the Punjab I followed up a panther that had come a long distance from the nearest Hills (Ulwar), and so little did the villagers realize the power of their visitor that some of them attacked him single-handed when they found him lurking near their goat enclosure and the Sirsa Hospital had 4 cases of bad mauling in consequence.

R. H. HEATH.

AHMEDABAD CAMP, 15*th June* 1910.

No. IV.—THE CALL OF THE SLOTH-BEAR.

I notice in last November's number of the Journal (No. 3, Vol. XIX) on page 745, that it is rare to hear Sloth Bears calling. I was in the Billigarungun Hills, Mysore, shooting last April, and coming back to camp in the evening heard a curious howling some distance off. This my Sholega

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trackers told me were bears. I went out in that direction next evening and met three bears together, out of which I was fortunate enough to bag two.

RONALD T. FOSTER, CAPT.,
1st Sherwood Foresters.

BANGALORE, *24th May* 1910.

No. V.—OCCURRENCE OF THE ERMINE (*PUTORIUS ERMINEA*) IN CHITRAL.

From Blanford's *Mammalia* (p. 166), it appears that the Ermine has only once been reported with any certainty from within Indian limits, *viz.*, from near Dros, north of the Zoge-la in Kashmir. Hodgson's specimen from Nepal is believed to have been obtained from a trader in skins, and Adam's statement that it occurs in the lower and middle regions of the Western Himalayas, is discredited by Jerdon, and his doubt apparently supported by Blanford, there being no skin other than the Kashmir one just referred to, in any of our Museums procured in the Himalayas.

It is interesting therefore to be able to record a specimen from within Chitral Territory, the skin of which I send you. This specimen was killed by a Chitrali at Ayun (*Circa* 5,000 feet), who saw it come down to the river to drink in March this year.

The skin was submitted to the Mehtar, who elicited from his attendants that it is called "mirimustran" in Khowar, and that "it is well known in Chitral, but is not commonly or numerously found everywere."

F. WALL, C.M.Z.S.,
MAJOR, I. M. S.

CHITRAL, 21*st May* 1910.

[In Volume XVIII, pp. 882-3, of the Journal, Mr. R. C. Wroughton described a new race of stoat or ermine under the name *Mustela whiteheadi* from three specimens obtained by Mr. C. H. T. Whitehead in the Hazara district, N.-W. Frontier Province. There is also a specimen in the Society's collection of what is probably a stoat in winter dress (but the tip of tail is missing, and it is impossible to say whether it is a stoat or a weasel) from the Kurram Valley where it was obtained by Colonel Rattray in February 1899. Shortly before Mr. Wroughton's paper was published we received a letter from Lt. D. MacIntyre of the 2nd Goorkhas, saying he had shot an animal like a stoat and asking if the stoat had been known to occur before in Chitral or India. He offered to send us the skin and skull of the one he had shot for examination, but though we asked for specimens none have been forthcoming. Mr. MacIntyre at the end of his letter mentions that his Chitrali shikari says "there are two kinds of the same animal, one large and the other like the one mentioned. The former (possibly the pine-marten), he calls *kharbush*, the latter *mush* or *musha*." Unfortunately we have seen no skin with a skull of the stoat from Chitral, and it is therefore impossible to say whether the one which is found there is the ordinary *Mustela ermineæ*, *M. whiteheadi* or the very small *M. ferghanæ* which was described by Mr. Oldfield Thomas in 1895 from a specimen from Ferghana, Central Asia.—EDS.]

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No. VI.—TAPIR (*TAPIRUS INDICUS*) NEAR HOUSES.

The Tapir which occurs in the South of Tenasserim Division is usually a very timid animal, but a friend told me the other day that a Burman at Kado had seen one in his garden in the evening. Kado is a large village a few miles from Moulmein. The Burman did not recognise it as a tapir, but described it as a very large 'pig' half black and half white.

J. B. MERCER ADAM, F.C.H.,

Assistant Conservator of Forests.

RANGOON. 27*th July* 1910.

No. VII.—NOTES ON TIGERS.

Perhaps the following notes may be of interest to some members. In 1909, a Karen took 5 tiger cubs, apparently from one mother. They were certainly all found in the same lair, so it seems certain they were all the offspring of one mother. I did not see the cubs myself, but I have had the story corroborated by respectable and educated Karens. I do not know if this is an absolute record, but I should fancy so, as my experience in Burma has been that the tiger generally has one or two cubs only, rarely three.

I came across a curious case of wanton destruction by a tiger the other day. The beast entered the town of Papan, and killed a bullock and a pony, wounding another bullock, so that it died next day. The tiger had no cub with it, so it was not a case of the mother teaching her young to kill, and the kills were separated, so that the tiger seems to have wandered round slaying. It is no uncommon thing for tigers to enter Papan and even to kill cattle in side sheds, which is strange, as the station is surrounded with dense jungle which contains plenty of pig and barking deer.

I heard a story the other day from some Karens that a tiger had a pair of cubs which she kept in the fork of a tree, apparently six or eight feet from the ground. I was unable to corroborate this, and had not even time to go to the spot, so I give the story for what it is worth; and hope that, if any members have heard of similar cases, they will let us have the benefit of their experience.

J. B. MERCER ADAM, F.C.H.,

Assistant Conservator of Forests.

RANGOON, 27*th July* 1910.

[The usual number of young produced by a tiger is two, but there are records of larger numbers up to five and even six is not unknown.

A tiger having young in a forked tree seems rather improbable and sounds more like a panther, though we have never heard of such an instance.—EDS.]

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No. VIII.—INTELLIGENCE DISPLAYED BY SHORT-BILLED MINIVETS (*PERICROCOTUS BREVIROSTRIS*) WHEN THEIR NESTS ARE IN DANGER.

The following extracts from my journal may, perhaps, be of some interest to ornithologists :—

12*th April* 1907.—To-day's result was *

and a nest of the short-billed Minivet (*P. brevirostris*) containing four young partially fledged.

The nest was placed on the upper surface of a horizontal branch of a medium-sized Himalayan Cedar (*C. deodara*), at a height of 30 feet from the ground, and was well concealed. It was only discovered by watching the movements of the parent birds * * * * * * * * * * * * * * * * *

I was greatly disappointed at not having found the nest before when it contained eggs, but to make up for the loss, I had the good fortune of being the spectator of the following incident, which clearly demonstrates the sagacity of birds.

When my man had climbed up the tree close to the nest, the parent birds (as I afterwards discovered them to be) began to behave in a most singular manner. They would turn their tails inwards between their legs, spread out their wings, and flutter down from a neighbouring tree on to the ground, just as a young bird, which could scarcely fly, would do. I thought at first that these birds were the young ones from some other nest which may be close by, and began chasing them about in order to catch them. As soon as I got close to one of them, it would steady itself, and fly on to the branch of a neighbouring tree, only to repeat the performance again. After watching them for some time, and observing them closely, I discovered to my astonishment that they were the parent birds! Their object in behaving in this extraordinary manner apparently was to entice us away from the spot by trying to delude us into the belief (as they undoubtedly did at first) that they were the young birds from the nest.

I did not disturb the nest that day, but when I visited the spot again a week later, the young ones were quite fledged, and flew off the nest long before my climber had got up to it. The old birds repeated the performance mentioned above. Of course, I was wiser this time.

* * * * * * *

31*st May* 1908.—I had another interesting experience with these birds to-day, exactly similar to the one related above.

On our way back home after a long ramble, we were passing along a hill covered with Himalayan cedars, and hearing a pair of these birds twittering quite close to us, I suspected that there was a nest, and accordingly began to search the trees; but could not locate it anywhere. That there was a nest

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I was certain, for the old birds had something in their mouths, and after flying a few yards off, would return to a particular tree (the one next to that on which the nest was situated), and would fly off again. Determined to find the nest, I ordered my man to climb each tree in turn, and make a systematic search on all the branches. While he was thus employed, I examined some of the other branches with a pair of binoculars. After a fruitless search lasting over an hour and a half, I decided to go home, and visit the spot again on the following day. We had just gathered up our guns and other things, and on taking the "last look," I happened to spot the nest. It was placed on the surface of a horizontal bough of a Cedar, about 25-30 feet from the ground. Its outline could only just be seen from below. Needless to say my climber was up the tree like a monkey, and when he got close to the nest, the old birds (who apparently knew for certain by this time that their family were in danger) became quite desperate, and began to behave in exactly the same manner as previously related.

The nest in this case contained two young ones, fully fledged, both of them flew off the nest as soon as my man got close to it.

P. T. L. DODSWORTH, F.Z.S.

SIMLA, *7th July* 1910.

No. IX.—THE HIMALAYAN GREENFINCH.

Could any ornithologist kindly let me know whether the Himalayan Greenfinch (*Hypacanthis spinoides*, Vigors) is a permanent resident at moderate elevations?

In the neighbourhood of Simla (7,000 feet), these birds first begin to appear about the middle of July to breed, remain till the end of October and then seem to disappear. Are they subject to a seasonal movement along the Himalayan ranges? Stoliczka states (J. A. S. B., XXXVII, pt. ii., page 61) that in the lower hills this bird is not uncommon even during the *summer months* between 5,000-9,000 feet, and is also found associated with the Himalayan Goldfinch (*Cardwelis caniceps*) in Spiti and Lahaul. The latter species appears to be partially migratory, being found in the summer at *high* elevations extending to W. Tibet, and during the winter months "all along the hill-stations of the *lesser* ranges."

P. T. L. DODSWORTH, F.Z.S.

CARLTON GROVE, SIMLA, *19th July* 1910.

No. X.—NOTE ON THE SPOTTED MUNIA (*UROLONCHA PUNCTULATA*) AND THE INDIAN RED MUNIA (*SPORÆGINTHUS AMANDAVA*).

This afternoon after a heavy shower of rain, termites started to fly out of a hole near one of my aviaries. They flew straight up and then through

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the wire netting, and whilst watching them, I noticed some of the Spotted Munias pick them off as they went through, and one or two of the Red Munias caught them in the air with their bills and devoured them whilst hovering. I can find no note of any of these birds doing this before, and it seems to be most interesting.

CHAS. M. INGLIS.

BAGHOWNIE FACTORY,
LAHERIA SIRAI, 18*th June* 1910.

No. XI.—NOTE ON BLYTH'S BAZA (*BAZA JERDONI*).

The following may perhaps prove of interest:—

On April 2nd, 1910, I secured a female specimen of Blyth's Baza (*Baza jerdoni*) at Kurseong, Eastern Himalayas, 6,000 feet, and I have seen the bird once before. I mention this as Blanford says in Vol. III., *Birds* (*Fauna of British India*) that it is a very rare species, and that only one specimen has been recorded from Sikhim and one from Tenasserim. My specimen had not assumed the adult plumage; its dimensions were length 19; bill from gape 1·35; tail 9·5; tarsus 1·5; expanse of wings 40.

It had eaten two Agamoid lizards (*Japallura variegata*) as well as several *Coleopterous* (Longicorn) and *Orthopterous* (Mantidæ) insects.

E. A. D'ABREU, F.Z.S.

KURSEONG, 2*nd April* 1910.

No. XII.—OCCURRENCE OF THE LESSER FLAMINGO (*PHŒNICONAIAS MINOR*) IN KATHIAWAR.

I gather from *Indian Ducks and their Allies* that this bird has not hitherto been recorded from Kathiawar. I was shooting at Bhimsana in this district (Okhamandal) on the 6th March last, when I was struck by the small size of a flock of Flamingos passing overhead within range, and dropped one of them. It was a Lesser Flamingo. I then turned my attention to the other flamingos on the water, and found that out of perhaps 300 birds, nearly 100 belonged to the smaller species. In places both species were feeding together when the differrence in size was much more marked than when on the wing. Apart from its smaller size, the Lesser Flamingo was distinguishable at a considerable distance with the glass by the dark colour of the bill.

A. W. MOSSE, CAPT., I.M.S.

DWARKA, 1*st May* 1910.

No. XIII.—PIED IMPERIAL PIGEON AND SHELDRAKE IN ARRACAN.

Mr. C. Hopwood, Deputy Conservator of Forests, Akyab, Lower Burma, has recently presented to the Society skins of a Pied Imperial Pigeon

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(*Myristicivora bicolor*) and Sheldrake (*Tadorna cornuta*). The pigeon was obtained at St. Andrew's Bay, Sandoway, on February 12th, and the duck at Nyangye, Kyankjn District on 31st January of this year.

The occurrence of these birds in Arracan is of great interest and as Mr. Hopwood writes "neither of these birds have been recorded from Arracan before." Within our boundaries the Pied Imperial Pigeon has a very limited distribution being only a seasonal visitant to the Andamans, but a resident in the Nicobars and according to Blyth, it is found in the Mergui Archipelago. Outside the Indian Empire, it is found in Siam, Cochin China, and some of the Indo-Malayan Islands.

There is no mention in *Indian Ducks and their Allies* of the Sheldrake occurring in Burma and in Bengal it is only of rare occurrence. Major Harrington has kindly informed us that a Sheldrake was shot by Mr. A. J. Jardine "at Meiktilla about 1887, and that it was identified on the spot by Colonel Adamson (late of the Burma Commission) and afterwards by the Bombay Natural History Society." We have been unable to find any reference to the skin either being sent for identification or presented to the Society.

N. B. KINNEAR.

6, APOLLO STREET, BOMBAY, *July* 1910.

No. XIV.—A BREEDING GROUND OF THE IBIS-BILL (*IBIDORYNCHUS STRUTHERSI*).

In the last week of April this year I was marching up the Bhaghirathi Valley and found that *Ibidorynchus* was fairly numerous at between eight and nine thousand feet. From Jalla to Harsil (where I first took these eggs in 1906) and up to and beyond Derali the river runs in several branches and with no great fall, through a wide valley and among large shinglebeds, and on these the *Ibidorynchus* breeds.

They are specially fond of nesting on the little islands, which are numerous and sometimes rather hard to get at; the nest is always placed right in the open; I never saw one under the shelter of a stone or stranded log as mentioned in the *Birds of India*, a common site is near the edge of a shingle-bank. The nest is easily found by keeping a sharp look-out ahead, and the bird will be seen running stealthily away; if the nest is not then immediately discovered the bird will return to it in a short time. I found fourteen nests in a few days, the eggs were mostly well incubated although I was a fortnight earlier than in 1906. In four nests, I found incubated clutches of three eggs, so it seems they sometimes lay three only. The nests have already been described, all I saw were made as before of little smooth black stones.

It is curious the eggs of this bird should have remained unknown so long,

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as Mr. Wilson of Harsil ("Mountaineer"), who corresponded with Hume on birds, was quite aware of the existence of *Ibidorynchus* at Harsil, and that they bred there; but from a letter of his in "*Stray Feathers*" it seems, he believed, they nested under logs and drift timber, so it is perhaps not surprising he had not seen the eggs. The villagers of those parts who are constantly about on these banks do not seem to know the eggs. I found a nest with the bird sitting on it not fifty yards from some men cutting up a huge log—work they had been at for several days. They were much pleased at being shown the nest, but said they had never seen the eggs before, really one would have thought they must have trodden on them sooner or later.

However, it is a good thing they do not know of and go for these eggs, as the whole breeding ground is only about ten miles long and is easily searched being merely the river-bed; and I was, therefore, careful to give them no hint as to the value of these eggs to collectors, or to take them out with me, as it would be a great pity were this interesting bird to be driven from this very favourite haunt, the only one, I believe, that has been recorded in British India, though doubtless others exist.

S. L. WHYMPER.

JEOLIKOTE, *July 28th*, 1910.

No. XV.—A VARIETY OF THE PEA-FOWL.

I have frequently heard Burmans say that there are two species of peafowl, in the one a tail is grown in the male, but the other species never gets a tail. I at first thought that this might be due to their being young birds or to bad feeding and seasonal conditions. But I was then told that the two species occur in separate flocks in the same areas, and the long-tailed species has yellow cheeks, the short-tailed brown. I have obtained a number of peafowl, but I have never been able to corroborate the existence of two species, although I think it probable that they do exist as the Burman is an accurate observer of birds and beasts. Perhaps some other member may have notes on the subject.

J. B. MERCER ADAM, F.C.H.,
Assistant Conservator of Forests.

RANGOON, *26th July* 1910.

No. XVI.—THE INDIAN WHITE-EYE (*ZOSTEROPS PALPEBROSA.*)

With reference to Captain Perreau's interesting article on the Seasonal Change of Colour in the Indian White-eye, I may mention I was mistaken in the same way when collecting in the Bhamo Hills; one day I shot a pair of *Z. palpebrosa* with chestnut foreheads, and at the time thought I had made a great find. But when the skins were taken to the Natural History Museum, S. Kensington, it was suggested that the chestnut on the foreheads

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might be caused by the pollen of flowers, and sure enough on the application of a damp rag, the chestnut came off showing it was not permanent, and so my new White-eye turned out to be only the Indian ones with discoloured foreheads.

H. H. HARINGTON, MAJOR,
92nd Punjabis.

MANDALAY, 22*nd July* 1910.

No. XVII.—THE IMPORTANCE OF CORRECTLY IDENTIFYING POISONOUS SNAKES.

A member of our Society has communicated to our Honorary Secretary a snake-bite casualty of special interest, as the snake was believed to be a krait, the injuries sustained treated under this belief, the symptoms were of a nature sufficient to impress most people with the idea that the patient was suffering from severe ophitoxæmia, and in reality the offender proved to be a snake of an innocent character.

The bitten subject, a cooly woman in Chanda (C. P.), aged 22, was bitten by a snake in two places on the middle of the middle right finger. Twenty-five minutes later she was brought to a dispensary, where the subordinate in charge believing the snake which had been killed and accompanied her, was a krait, applied a ligature, freely incised the wounds, rubbed in crystals of permanganate of potash, and injected two doses of antivenene 30 c.c. each. She complained of burning pain in the hand and arm which later became numb, thirst, and vomitted twice. Half an hour later, she was comatose with respirations 30 per minute, and a weak pulse of 120, which later became imperceptible, and swallowing was reported as impossible. After lying unconscious for 5¼ hours, with brief intervals of consciousness, she revived, asked for water, drank, and then slept soundly to awake next day quite well, except for burning pain and numbness in the hand and arm.

Fortunately the snake was killed, and our correspondent had it placed in a bottle, and sent it to the Honorary Secretary, when it proved on examination to be the harmless Wolf snake (*Lycodon aulicus*). The notes of the case were supplied by the Hospital Assistant who attended the case.

The symptoms—vomitting, collapse with weak pulse, and incapability to swallow (not a genuine paralysis) are all to be attributed to an attack of syncope, in the main due to fright, but probably aggravated by the pain occasioned by the surgical wounds, and the burning of the permanganate.

Had the snake not been killed, this casualty like so many others would probably have been reported as another case of snake-poisoning cured by antivenene or permanganate of potash. It is a pity that every case of snake-bite known to our members is not similarly reported, especially when the snake, as in this instance, is available for trustworthy identification.

F. WALL, C.M.Z.S.
MAJOR, I.M.S.

CHITRAL, 19*th May* 1910.

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No. XVIII.—A FATAL CASE OF VIPERINE POISONING.

Our Secretary has forwarded me the detailed notes of a snake-bite casualty which ended in the death of Mr. W. N. Neale lately near Broach. These notes were furnished by the Assistant Surgeon and the Civil Surgeon, who attended the case, and from these I extract the following information. Mr. Neale was bitten below the inner bone of the right ankle on the night of the 12th of May by a snake which he saw and described as being about two feet long. He was wearing socks at the time. He came indoors, applied a ligature above the ankle, and unable to persuade his servants to cut open the site of the injury had to do so himself, making two superficial incisions with a razor, and then he applied crystals of permanganate of potash. From the notes I conclude that the incisions, and the application of the salt were not what a Surgeon would consider at all satisfactorily performed.

He passed a restless night, and in the morning sent for a local snake charmer, who grasped the tissues as well as he could two or three times with his teeth, and sucked with the idea of forcibly extracting the poison. Being in great pain he sent for an Assistant Surgeon, 11 miles distant, who arrived in the afternoon of the 13th instant. He found two fine punctures ½ an inch apart at the seat of the injury, one being very slight; the other was still bleeding and the foot was enormously swollen and discoloured greenish-blue. Mr. Neale was in great agony.

On the 14th instant the patient developed bleeding from the gums. He appears to have remained in much the same state till the 18th instant when he was carried to Tankari, and admitted into hospital, at 4 a.m. on the 19th. His wounds had then healed, and the foot had completely subsided to normal proportions, but there was swelling of the right calf and thigh. Later, pain in the right groin shooting into the abdomen was experienced, and the abdomen became distended, painful and tender. There were blood stained patches and spots in the skin of the arms and chest, and a large extravasation formed over the right buttock, and bled freely externally. His gums were still bleeding. He had no fever, but his respiration was hurried, and his pulse weak, and frequent. An enema relieved the abdominal symptoms, the stool being very dark (probably from admixture with blood).

On the 20th he had very severe pain in the right hip, which became swollen, and he could not bear to have it touched or moved. He was decidedly weak as shown by his pulse and at 2 a.m. had a fainting fit. He then complained of burning pain all over the body, and still had special pain in the right calf and thigh, but his abdominal pain was less and the swelling reduced. He vomitted three times during the day. Bleeding from the buttock had stopped, and the bleeding from the gums was slight. He had another fainting fit at 6 p.m. but rallied again. At 10-30 that night

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the Civil Surgeon arrived from Broach and found the patient quite conscious, free from any nervous disturbance, but very exhausted. The breathing was distressed, and there was some congestion of the lungs. The pulse was thin and weak. The extremities were cold and livid. The gums were blue, spongy, and bleeding, and expectoration blood-stained. There were extravasations of blood beneath the skin of various sizes on the face, chin, neck, chest and back, and a very large one over the right buttock, and another on the inner side of the left (right?) thigh. The right foot was swollen to twice the size of the left, the tissues round the bitten part were sloughing and there was cellulitis of the foot and ankle.

The abdomen was tender and swollen. He saw a tarry stool that had been recently voided. In spite of every endeavour to save the patient, he continued to grow weaker, and died from heart failure at 2 a. m. on the 21st May.

Remarks.—The symptoms detailed above are all due to diminished coagulability of the blood, such as we know is induced by the poisons of both vipers and colubrine snakes. The absence of any nervous phenomena, negatives the idea that the culprit was a colubrine species, whilst the severity of the symptoms arising from the altered state of the blood, which we know are specially pronounced in viperine toxæmias, strengthens the assumption that it was a viper that inflicted the injury. The casualty occurring near Broach clearly points to the offender being either the "Phoorsa" (*Echis carinata*), or Russell's viper (*Vipera russelli*), but we cannot be certain which.

The symptoms are just those that might be seen in a case of scurvy, a disease in which the coagulability of the blood is profoundly altered. Visible hæmorrhages occurred from the gums, which were just in the same state that is so typical of that disease, from the bowel and beneath the skin. Invisible hæmorrhages account for the pain, tenderness, and swelling of the abdomen, and vomitting which recall to the physician's mind the identical state of affairs one sees in Henock's purpura, another disease affecting the coagulability of the blood. The pain, swelling and tenderness of the right hip joint is similarly explained reminding one of the kindred state—arthritic purpura. Further invisible hæmorrhages explain the swelling and pain in the muscles of the calf and thigh. Death was due to exhaustion from constant hæmorrhages.

F. WALL, C.M.Z.S.,
MAJOR, I.M.S.

CHITRAL, 9*th June* 1910.

No. XIX.—FOOD OF CROCODILES.

With reference to Captain Forsyth's inquiry in the last Journal, I have also *frequently* found large numbers of round stones in the stomachs of Gharials (*Gavialis gangeticus*), shot on the Gogra River.

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The stones always had a most offensive odour, and gave one the idea of having been in the stomach for some time. Even after the lapse of several months, and constant exposure, they never lost the smell entirely.

It is some years now since I last shot a crocodile, but, as far as I remember, I generally found these stones only in the stomachs of the *large* ones; I have hitherto always been under the impression that these stones were taken as aids to digestion, but it would be most interesting to know the exact purpose which they serve.

P. T. L. DODSWORTH, F.Z.S.

CARLTON GROVE, SIMLA, S. W.,

17th July 1910.

No. XX.—ANOTHER FATAL INSTANCE OF VIPERINE POISONING.

I have to-day despatched to you a specimen of a snake obtained at Hangu (2,700 feet) in the district a few days ago; I shall be very much obliged if you will identify the snake for me. As far as I can tell, it seems to be an *Echis carinata*; this snake caused the death of a kakar serving under me, who was bitten and treated by potassium-permanganate and ligature—in the accepted way—almost immediately; he died however in 27 hours after the accident with symptoms of viperine toxæmia.

This snake is said to be common in Hangu though I have not met it before. I have had successful cures of *Echis* bite in Kohat (1,700 feet) during the last 3 years.

I shall be much obliged if you will let me know as soon as possible how you identify the specimen sent.

C. H. REINHOLD, CAPT., I.M.S.

FORT LOCKHART, N. W. F. P.,

19th July 1910.

[The snake proved to be a specimen of *Echis carinata*.—EDS.]

No. XXI.—VARIETIES OF THE COMMON GREEN WHIPSNAKE (*DRYOPHIS MYCTERIZANS*).

In our last Journal (p. 229) I made some remarks on the varieties of this snake, but overlooked the fact that the variety I alluded to under the name *lepidorostralis* had been already christened by Dr. Annandale under the name *anomalus*. This latter name must of course take precedence and my apologies are due to Dr. Annandale for my oversight.

F. WALL, C.M.Z.S.,

MAJOR, I.M.S.

CHITRAL, *15th August* 1910.

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No. XXII.—FISHING IN BURMA.

Very little seems to be known about the game fishes of Burma, and my object in writing is to ask members to give their experiences as to the species, localities and proper bait to use at the different season. I am a keen fisherman, but I know very little about identifying the species, and should be thankful to be recommended a good book on the subject of classification.

My experience has been that the best flies to use are generally dark flies, hackle and no wing, with a silver body at dusk. Peacock feather is useful also. Of the winged flies, I prefer Brackenclock and Alexandra. As regards spoons, I find copper and silver the best and of artificial baits, a silver devon or a blue and silver rubber minnow, my objection to the latter being that it quickly becomes brittle in this climate.

I have found mahsir in the Sittang in Pyinmana District, and also the fresh water shark (*ngamyin*). The mahsir also occurs, I believe, in the Bilin Chaung in Thaten district and in the Salween and its tributaries, but I have not caught them myself here.

I should be much obliged if some Burma member could give me the Burma name of mahsir? I have heard "ngatamigma" used in Pyinmana, but elsewhere in the dictionary it appears to be used for a species of catfish. In the Salween and Thaten districts the name is apparently "Ngathalin." I find an irregular use of the names of fishes in different places, and it is difficult to find a Burman who can give the names of the species, except the very commonest, with certainty.

J. B. MERCER ADAM, F.C.H.,
Assistant Conservator of Forests.

RANGOON, 27*th July* 1910.

[The true Mahseir (*Barbus tor*) is not found in Burma, but there are sereval other large species of *Barbus* which inhabit the Burmese rivers. Thomas's "Rod in India" and Day's Fishes (*Fauna of Brit. India*) are the best books for classification, but we shall be happy to identify any specimens which may be sent in spirit to our the Society's Museum.—EDS.]

No. XXIII.—NOTE ON DR. BENTLEY'S PAPER "THE NATURAL HISTORY OF MALARIA.

One of the methods recommended in the above paper for the clearing of wells and fountains of Anopheles larvæ is the introduction of the small surface-feeding fish called "Piku." It will be of interest to the members of our Society to know that the first to recommend these fish, and to use them for this purpose was the late Mr. E. H. Aitken, one of our original members. I remember well in the monsoon season of 1902, when living in a chummery with him in Ezra House, Apollo Bunder, the delight with which he watched the lightning-like darts of the Pikus when mosquito larvæ

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were placed in the aquarium he kept in the verandah. Many a day have I spent with our old friend Elia, in searching the valley to the west of the Malabar Hill reservoir, for mosquito larvæ for the purpose of feeding these hungry fish. We used to call the Pikus "scooties" because of the extreme nimbleness of the fish and the way they dart about like boys after a football.

Observing the eagerness with which the scooties devoured mosquito larvæ Mr. Aitken introduced a lot into the basin of the Wellington Fountain in front of the Sailors' Home in Bombay with the object of keeping the water free of larvæ; but alas, boy nature is the same all the world over, and in a few days our scooties had disappeared. The locality where he got the scooties from was the pool below the bund of the Vehar reservoir, where they swarm in hundreds.

I can add my testimony to the value of these fish as devourers of larvæ for I have kept them ever since in the tank in my fernery at Parel, and I can never find any mosquito larvæ there.

W. B. BANNERMAN, M.D., D.SC.,
LT.-COLONEL, I.M.S.

PAREL, BOMBAY, *July* 1910.

No. XXIV.—PAIRING OF THE SPIDER *NEPHILA MACULATA*, FABR.

For a long time the manner of the copulation of spiders was a subject of much doubt and speculation, as also the purpose of the specialisation of the male palpal organ.

In recent years research has revealed the delicate anatomy of the male palp and its adaptation as a sort of force pump capable of taking up and ejecting the seminal fluid. It has also been discovered that the fertilisation of the female is not effected by direct copulation, but through the agency of the male palp as an intromittent organ. However, direct observations have been very few, so that a description hardly needs an analogy.

With so large a spider as *Nephila maculata* (the body of the female is about 35 mm. long), observation is specially favourable, and I consider myself fortunate in happening on a pair in the act.

The male of *Nephila maculata* (of all the *Nephila* I believe) is very much smaller than the female and bears no resemblance to her. As the male is not described in the volume of *The Fauna of British India* on *Arachnida*, it may be of interest if I transcribe a short description from my notes.

"Length of body 8 to 10 mm., uniform light brown, the abdomen of a slightly darker shade than the thorax; legs in the same proportion as in the female and darker brown than the abdomen. Palp with a globular appendage terminated by a long acumen, globular portion jet black with black bristles above. The abdomen is rounded oval and not elongate as in the female" (see figure of the latter on page 218, *Arachnida, loc. cit*).

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The female in the present instance was hanging vertically, head upwards in the remains of a web at a height of three feet. When I first saw the group the male had evidently already charged his palps with the seminal fluid, for I could not thereafter detect any movement or gesture that in any way suggested the taking up of any substance. I am not, therefore, able to throw any light on this operation about which too little is known.

He was running excitedly over the back of his consort in a rather aimless manner, so that it almost seemed that he imagined himself on the ventral surface and had lost his bearings. However, he very soon slipped round behind the fourth pair of legs and took up a position a little below the genital aperture so that he could reach to it with his palps by flexing the forelegs and straightening the hind ones. He then struck at the genital aperture, by alternate, rapid pecks of the palps, much as the fingers strike the keys of a typing machine. After a dozen strokes or so he drew himself back by straightening the front limbs and flexing the hind ones, and pausing for an instant, appeared to be replenishing the stock of semen at the distal end of the palp (this renewal is, of course, mere suggestion as no movement was seen that would prove it, but in any case the palps were held up and were not applied to any part of the bodies of either of the pair during the short interval). He then stretched forward towards the vulva once more and recommenced the tap-tapping. These operations were reiterated several times during a period of the three or four minutes. I had then to move on but on repassing the spot about half an hour later, the male was observed quietly squatting on the female's back. Throughout, the female was absolutely quiescent and made no attempt at molesting her spouse—a fact that does not agree with the popular idea that the female invariably devours her mate if opportunity offers.

This event took place on the 28th May, a very early date for these spiders which usually appear after the monsoon has broken, at least in these parts; indeed, these were the first specimens I had seen since January.

It would be interesting to ascertain where the eggs are laid and when they hatch out. I have never seen egg-sacs in the webs, and I have never come across immature specimens of this spider. I have noted males in the webs from October to December and gravid females in November and December.

Where are the eggs deposited, when do they hatch out, where do the immature individuals live, do the eggs only hatch out after the hot season? these are points for elucidation.

The disparity in size between the males and females is further evidence of Nature's economy where economy is desirable. It is the normal condition among lowly creatures for the females to be larger and more formidable than the males; not only is this necessary for defence but also for the provision of a large number of offspring. In such cases the females are

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usually polyandrous, and in the case of the subject of this note, it is common to find several males in each web.

The greater importance of the females with polyandrous creatures and her subjection among polygamous and monogamous ones may be verified even among human beings and suggests philosophical reflections which, however interesting, are, perhaps, out of place in a Journal devoted to Natural History.

C. E. C. FISCHER.

COIMBATORE, *June*, 1910.

No. XXV.—FURTHER NOTE ON THE SPIDER *NEPHILA MACULATA*.

In connection with certain points raised at the close of a note on the copulation of the above spider, I would like to note that I have to-day (10th June) found a young female in a small web spread between two bushes, about three feet from the ground.

From the following comparative measurements, it will be seen that the individual was quite young :—

	Young.	Mature, *vide* 'Arachninda,' page 217.
Total length ..	9 mm.	37 mm.
Carapace ..	3 mm.	12 mm.
1st leg	24 mm.	72 mm.
4th leg	21 mm.	64 mm.

The young one seen to-day was found at an elevation of about 500 feet, whereas the pair in *copula* were seen at nearly 3,000 feet, some 20 miles from here.

To-day's capture seems to show that the eggs are hidden somewhere to tide over the dry season, and the young ones hatch out when there is sufficient moisture and very soon build their webs. I may mention that the adult pair found some days ago were on bushes in swampy ground bordering a perennial stream and, therefore, in a permanently moist atmosphere.

DONI, SOUTH MALABAR,
10*th June* 1910.

C. E. C. FISCHER.

No. XXVI.—BIOLOGICAL NOTE ON *APHNÆUS HYPARGYRUS*.

(*With a Plate.*)

A. hypargyrus (Butler) is confined to N.-W. India, Sind and Afghanistan in particular. These notes were made on specimens captured on the wing or bred from ova at Hyderabad, Sind. In this place, the insect is

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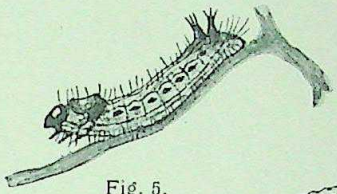

Fig. 5.

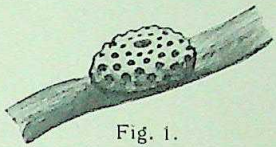

Fig. 1.

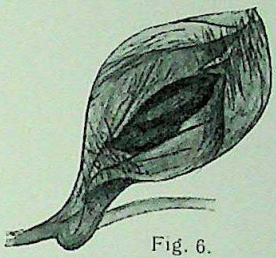

Fig. 6.

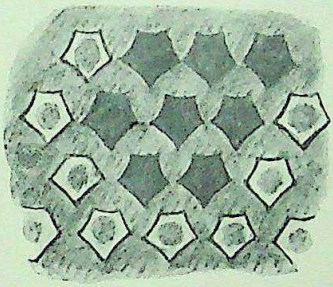

Fig. 3.

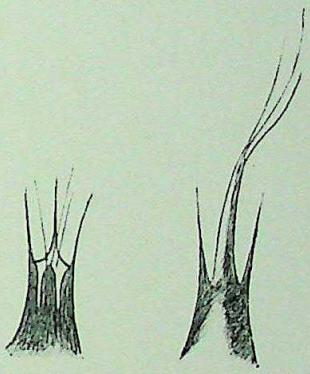

Fig. 2.

Fig. 4.

Fig. 8. ♀

Fig. 7. ♂

Fig. 9. ♀

F.cF.

LIFE HISTORY OF APHNÆUS HYPARGYRUS.

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locally plentiful, being restricted, as far as I have observed, to two small areas of rather more than one acre in extent. The country for some miles round furnished no specimens.

The imago is too well known to need a further description here, but I have shown in the plate figs 7, 8 and 9 the upper sides of male and female and underside of female. They are generally seen in small groups of three or four settling on or fluttering round low bushes or herbs at the corners of intersecting pathways or roads.

The ovæ shown in the plate, fig. 1, are the size of the head of a No. 10 entomological pin and are not unlike the spineless shell of *Echinus esculentus*. They are dome-shaped, flattened on the resting surface and present a pit at the apex of the dome. The upper surface is mamillated and finely pitted between the mamillar processes. In colour they are a dead-white and are exceedingly beautiful objects under a low power microscope. They are deposited usually on a dead twig in juxta-position to the food-plant or they may be laid on the bract at the base of a leaf-stalk.

On the 5th day the larvæ hatch out and appear first as tiny, hairy, mahogany-red creatures. The head from first to last moult, is a shiny jet-black. The hair of the first skin is coarse and white with the exception of eight black hairs which project horizontally back from the rear of the thirteenth segment.

The full-grown larva is a prettier object than the generality of its class. Fawn is the prevailing colour, but the mahogany-red tint persists on the first three segments and on the dorsum of the 11th, 12th and 13th, there is however a small patch of fawn on the sides of the first two segments.

There are fine double-lines of mahogany-red along the back and sides and a row of dots of the same colour extending from the 4th to the 10th segments. On the dorsum of the second segment is a shiny, black chitinous plate beneath which the head of the larva is retracted when alarmed.

The head is usually quite visible, especially when the larva feeds, thus differing from most lycænid larvæ. On the back of the twelfth segment, the larva bears two fleshy pillars surmounted by three stiff bristles, arranged in an equilateral triangle.

These pillars are hollow and from them project fine hairs. When the larva is irritated, a fleshy tongue is flickered in and out of these with great rapidity, very much in the manner of a snake's tongue. A diagram of these pillars is shown in fig. 2, the latter representing the tongue projected and showing the fine hairs attached to its tip.

When the larva is at rest, it will project the tongue like processes in and out, about every ten seconds and will continue doing so for long periods. I was not able to determine whether this action was protective in nature or for the purpose of signalling up ants. I noticed that it was carried on for a long time preparatory to spinning the cocoon. Like most lycænid larvæ

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they are nearly always attended by ants, and this fact is of great use in searching for them, as it is easier to notice the ants than to see the larvæ.

Their food-plant is a species of *Cassia*, and they show a partiality to the young buds. When moulting they spin two or three leaves together, in which they lie until the change is effected. Often two or three will go into partnership to build this temporary cocoon, but as soon as the cocoon is finished the partnership is dissolved, and they wander off in different directions. The partnership is almost invariably brought about by the agency of ants, who pilot the larvæ to a suitable spot. The final cocoon is but a little more compact than the temporary ones and usually consists of two leaves, loosely woven together and open at both ends. The pupa is firmly fixed by the tail to one portion of the cocoon, and is dark-brown or blackish in colour. The head is rounded and stands out in relief from the body by reason of the very prominent shoulders. The abdomen tapers gradually.

The larvæ viewed under the microscope show a remarkable arrangement of star-like, fleshy processes which cover the entire skin so closely as to form a complete net-like coat. Fig. 3 shows a portion of the skin at the site of one of the lateral spots, viewed from above and it will be observed that the colouration is confined to the stellate processes. Fig. 4 shows them in profile.

The pupæ hatch out in from ten days to some weeks, this depending on the season.

F. C. FRASER, M.D.,
CAPTAIN, I.M.S.

HYDERABAD, SIND, *June* 1910.

LIFE HISTORY OF *APHNŒUS HYPARGYRUS*.

EXPLANATION OF PLATE.

Fig. 1. Egg, seen under ¼ objective.
" 2. Pillars, showing process retracted and protruded.
" 3. Skin, showing arrangement of the stellate papillæ.
" 4. Stellate papillæ in profile.
" 5. Larva, slightly enlarged.
" 6. Pupa.
" 7. ♂ imago.
" 8. ♀ "
" 9. ♀ " (underside).

No. XXVII.—ENTOMOLOGICAL NOTES.

CROCE FILIPENNIS, WESTW.

(*With a Plate.*)

In April the insect is found flying in houses usually in the morning and evening. It hovers in the air, not however at one place but always with

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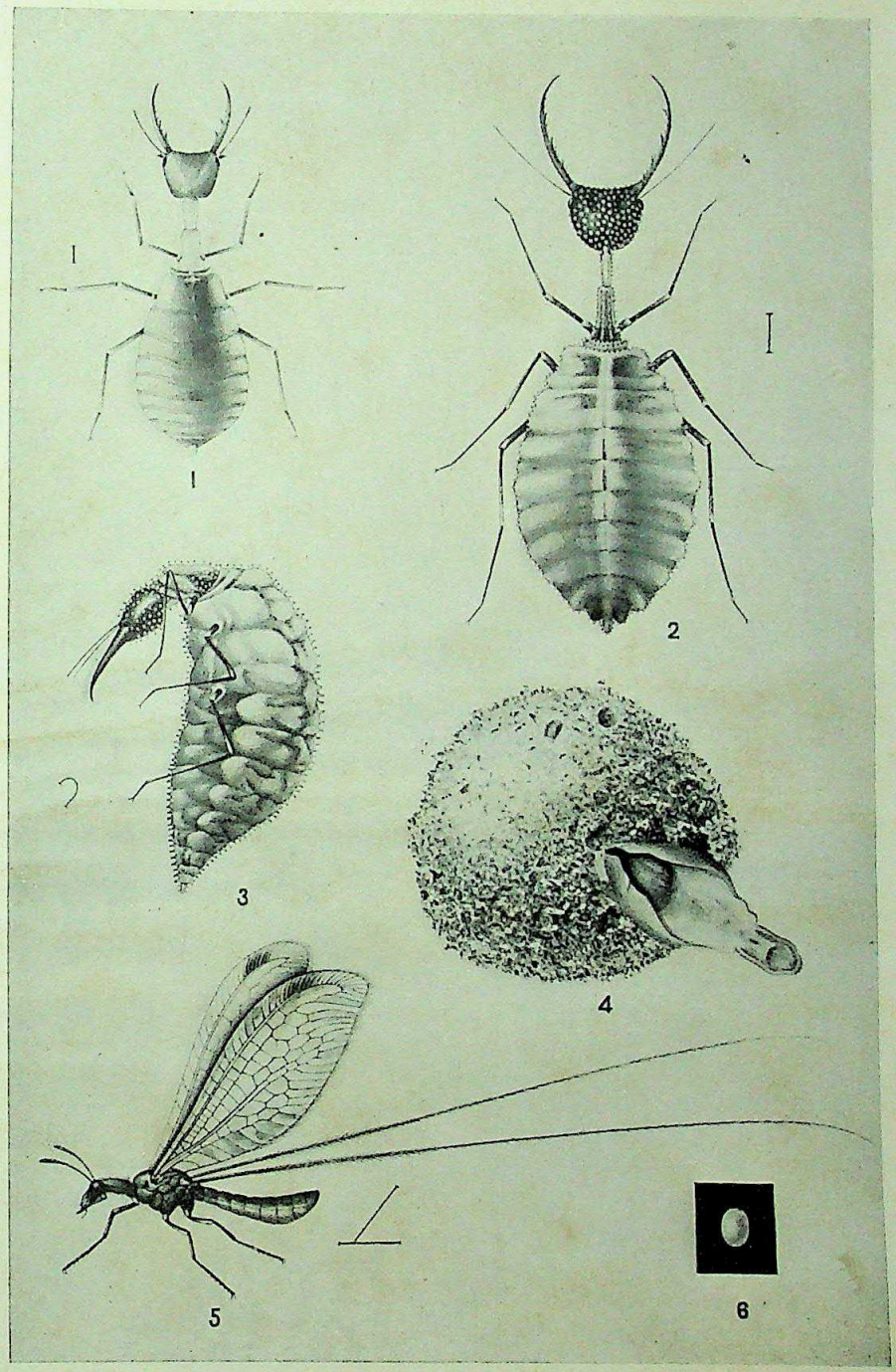

Croce filipennis, Westw.

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a forward and backward motion. The mode of flying is rather clumsy on account of the unweildy nature of the much elongated linear hind wings. It may be found in the company of mosquitoes, but can be at once distinguished from the peculiar manner of fluttering. The adult winged insect appears only in April, lays eggs and dies within a few days. Only one cycle is passed through in the course of the whole year, the egg and pupa stages occupying about a week and three weeks respectively and the larval stage the rest of the year.

Egg.—The insect laid eggs freely when captured alive and confined with a little quantity of dry dust or sand. Three laid 5, 6 and 8 eggs, respectively. The egg is almost round or slightly oval, the diameter being about ½ m.m. in one direction and a little less in the other. The surface of the egg is smooth, and the colour very pale yellow with a slightly bluish tinge. In confinement eggs were deposited either in clusters of 2 to 5 or in a scattered manner, a single egg being laid at one place. In the cluster they stuck to one another loosely. The eggs hatch in about 8 days.

Eggs laid on	Hatched on
4th April ..	.. 12th April
19th „ ..	.. 27th „
23rd „ ..	.. 1st May

Larva.—The young larva hatches out by bursting the egg shell which is white when empty. It measures a little more than 1 m.m. from the tip of the jaws to the hind end. The general appearance and shape are characteristic and remain the same throughout the larval state, *viz.*, a flattened and somewhat disc-shaped body with an elongated, narrow neck bearing the big round head, which is armed with formidable jaws. The 3 pairs of legs are slender and long. The colour of the body of the young larva is pale yellow and changes to grey with growth. After the first moult minute knobbed processes are apparent on the body, which help the larva to simulate the colour of the earth by holding particles of dust among them. The head and the jaws in the young larva are yellow and become brown later on. A grown up larva measures about 7 m.m. from the tip of the jaws to the hind end and about 3 m.m. across the thickest part of the abdomen. The neck is about 1½ m.m. long and the jaws about 1¼ m.m. The body segments are not clearly cut, but are more or less distinct on account of ateral indentations and shadings of colour. Fig. 1 pictures a larva 20 days old and fig. 2 are 7½ months old.

The larvæ were observed to moult only once, just after a month after hatching. The skin split from about the middle of the body over the neck to the base of the head, whence the fissure extended laterally forward on each side to liberate the head and the jaws.

The larvæ, especially when young, are active creatures and run about rather quickly in search of food. They were fed with silver-fish (*Lepisma* sp.)

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and occasionally with bed bugs. They preyed on each other, when no food was available. They used to sit with the body hidden under dust or rubbish and lie in wait with open jaws for any passing silver-fish. They were not infrequently dragged to some distance by the prey, but hardly ever let go the hold. The silver-fish was often made motionless by pricking before being supplied and the larvæ would come and suck it. The winter was passed in a more or less resting but not a perfectly dormant condition. The larvæ stirred out if touched. They wanted no food at the time.

The larval stage lasts about a year. Some hatched on the 12th April and formed cocoons the next year between the 20th and 30th March.

PUPA.—The larva pupates in a round cocoon formed by binding particles of sand with a very thin white silk exuded from the hind end. A retractile straight yellow needle-like process is thrown out and taken in alternately, which applies the silk to the particles of sand by touching them with its tip from which the silk appears. All this time the larva either contracts or expands the body and keeps on turning round and round slowly. The finished cocoon measures about 4 m.m. in diameter and looks like a small ball of particles of sand cemented together loosely. Before turning into the pupa the larva rests for some time inside the cocoon with the head doubled on the ventrum. Such a resting larva is pictured in fig. 3. The pupa also remains ventrally curved inside the cocoon. Before emergence of the imago, it begins to straighten the body alternately. Thus the head strikes against the wall of the cocoon. In this way a hole is burst open in the wall of the cocoon through which the head with a portion of the thorax is pushed out. Then the skin bursts along the middle of the thorax and head and liberates the imago. Fig. 4 pictures an empty cocoon with the pupal skin protruding out of it. The period of the pupal stage is about three weeks. One formed cocoon on 20th March and emerged as the winged insect on 12th April.

C. C. GHOSH,
Assistant to Imperial Entomologist.

PUSA, BENGAL, *June* 1910.

EXPLANATION OF PLATE.

Croce filipennis, Westw.

1. Young larva, 20 days old, 1st stage, × 25.
2. Larva, 7½ months old, × 18.
3. Larva resting inside cocoon before pupating, × 18.
4. Cocoon with the pupal skin protruding out, showing how the imago emerges, × 16.
5. The adult insect, × 6.
6. A single egg, × 18.

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No. XXVIII.—THE FOOD OF DRAGON-FLIES.

I was much interested in Mr. Maxwell-Lefroy's note on what Dragon-flies eat. I have never been able to identify an insect taken by one but that they are very bold in attacking some of a size nearly equal to their own, is, I think, pretty certain. When fly-fishing in the evenings, I have repeatedly seen a dragon-fly follow and strike at the flies on my cast. Even more curious when fishing for *oreinus* with a mulberry on my hook, I have repeatedly seen a dragon-fly go for the mulberry as I swung it over the rapid, and felt the sharp tug to the line caused by its striking it. No doubt it took the mulberry for a beetle, but is it possible that the dragon-fly could have killed and eaten a beetle of the size of a ripe mulberry? I can only state what has actually happened. My experience is probably not singular, as the same thing has happened so often.

F. J. MITCHELL.

SRINAGAR, 31*st July* 1910.

No. XXIX.—NEW VOLUMES OF THE "FAUNA."

With reference to the Imperial Entomologist's list (Journal, Bombay Natural History Society, Vol. XX, page 203) of the Volumes sanctioned by the Secretary of State for publication in the *Fauna of British India and Ceylon*, may I inform your readers that the two additional Volumes have recently been sanctioned and are now in the course of preparation in the Indian Museum, Calcutta. Assistance in the collection of specimens to be used in the preparation of these Volumes would be most gratefully accepted. They are to deal with (I) the Nemocera other than mosquitoes and Chisonomidæ (*i. e.*, the crane-flies or daddy-long-legs, fungus-midges, moth-flies, etc.) by Mr. E. Brunetti and (II) the sponges, coelenterates and polyzoa of stagnant water by myself. The Editor of the "Fauna" has also asked me to make arrangements to obtain for him specimens of ticks, leeches and meloid beetles (blister-flies) to be used in the preparation of other volumes in England and America. Most Indian Zoologists will agree as to the importance of rendering the official "Fauna of India" as complete as possible, and I have, therefore, no hesitation in appealing for assistance to the Members of the Bombay Natural History Society. I think it is a matter for special congratulation that it should at last have been found possible to sanction the preparation of part of the "Fauna" in the country with the animals of which it deals.

CALCUTTA,
6th August 1910.

N. ANNANDALE,
Superintendent of the Indian Museum.

[We hope members will collect specimens of the above mentioned animals, and we shall be happy to forward them to England or Calcutta.—EDS.]

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No. XXX.—SCIENTIFIC NOMENCLATURE.

I am glad to reply to Mr. Venning's note. There can be no doubt that the botanical genus *Melastoma* is feminine, but the snake genera *Lycodon* and *Oligodon* are quite properly treated as masculine; the vowel in the last syllable is the Greek Omega, and the names (though ionic dialectical forms rather than Attic Greek) are quite correctly formed adjectives, masculine or feminine at choice.

As to the Latinising of proper names, I think the position is as follows. The termination of a family name in Rome was—*ius*, because the name was an adjective; Cæsar's family name was *Julius*, because he belonged to the *Gens Julia*, the Julian family. A personal name, however, would be treated as a substantive, and made Latin by the simplest practicable alteration, such as the addition of—*us*, if no acknowledged Latin form already exists. Hence the family names Brown and Smith should be *Brownius* and *Smithius;* but (and from the point of view of scientific species-names this is the important fact) the genitives of names ending in—*ius* should properly be written to end in—*i* only, not in—*ii*; thus the genitive of *Caius* is *Cai*, of *Smithius Smithi* and as this is the case usually in question, the matter seems to be resolved thereby.

EDWARD MEYRICK.

MARLBOROUGH, WILTS., 22*nd July* 1910.

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PROCEEDINGS

OF THE MEETING HELD ON 23RD JUNE 1910.

A Meeting of the Members of the Bombay Natural History Society took place on Thursday, 23rd June, at the Society's Rooms, Mr. John Wallace, C. E., presiding.

The election of the following 61 new members since the last meeting was duly announced :—Mr. G. E. Browning (Trichur) ; Miss Margaret E. Fountaine (England) ; Mr. J. A. MacGregor (Bezwada) ; Mr. D. de M. S. Fraser (Goona) ; Mr. G. F. de Montmorency, I.C.S. (Lyallpur) ; Mr. A. A. Brown (Bombay) ; Mr. W. G. Moore (Mandalay) ; Mr. E. Street (Mandalay) ; Mr. H. E. Beamish (Mandalay) ; Mr. H. D. Giberne (Mandalay) ; Mr. W. H. L. Cabell, I.C.S. (Bhamo) ; Mr. Fred. Bishop (Rangoon) ; Mr. W. B. Sommers, M.B. (Rangoon) ; Mr. T. M. S. Culbertson, A.M.I.C.E. (Bombay) ; Mr. H. R. Aston (Shwebo) ; Mr. E. L. Moysey, I.C.S. (Bandra) ; Mr. A. O. St. J. Dixon (Bombay) ; Mr. P. O'Brien (Thana) ; Mr. E. J. Farmer, I.C.S. (Lashio) ; Mr. David W. Winsor (Sirur, Poona) ; Dr. M. F. Suter (Bombay) ; Mr. O. C. B. Wimbush (Bombay) ; Mr. G. M. Boughey, I.C.S. (Simla) ; Mr. Chas. S. Schults (Tokio, Japan) ; Mr. V. H. Boalth (Lahore) ; Mr. W. D. Cruickshank (Bharatpur) ; Mr. B. L. Chavdhari, B.A., B.Sc. (Calcutta) ; Mr. Granville Lee-Warner (Jubbulpore) ; Capt. M. E. Rae (Bombay Political Department) ; Mr. C. R. S. Betts (Bokahat, P.O., Assam) ; Mr. J. G. Ryan (Cawnpore) ; Lt.-Col. E. G. Snow (Peshawar) ; Lt. C. E. Litchfield (Peshawar) ; Lt. H. G. Robinson (Peshawar) ; Mr. F. J. Mitchell (Srinagar) ; Mr. W. Walsh (Shwebo) ; Mr. T. S. Grigson (Rangoon) ; Mr. Frank T. Barton, M.R.C.V.S. (England) ; Capt. A. T. Hunt, R. N. (East Indies Station) ; Mr. C. William Beebe (U.S.A.) ; Mr. A. W. King (Dacca) ; Mr. M. C. Koechlin (Travancore) ; Mr. A. J. Turner, B. Sc. (Lon.) F.I.C. (Bombay) ; Mr. P. M. Baker, B.Sc. (Lon.) A.M.I.M.E., A.M.I.E.E. (Bombay) ; Mr. H. S. Chatfield, B.A., Oxon. (Bombay) ; Mr. David Arthur, I.M.S. (Lucknow) ; Mr. A. D. Keogh (Narayanganj) ; Capt. G. C. Morphett (Punjab) ; Capt. A. M. Rundall (Dalhousie) ; Mr. W. S. Powell, I.F.S. (Rangoon) ; Mr. Walter Ogilvy (Monywa) ; Mr. A. G. Murray (Nelliampatty) ; Mr. A. F. Hood (Kindat) ; Mr. J. P. Bradshaw (Bombay) ; Capt. G. A. Hassels-Yates (Bombay) ; Mr. G. O. De R. Channer (Murree) ; Mr. J. R. Webster (Bombay) ; Mr. F. M. O'Callaghan (Gauhati, Assam) ; Mr. C. E. Milner (Tharrawaddy) ; Mr. A. E. Jones (Simla) and Mr. W. Colin-Durham (Bombay).

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CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary, Mr. W. S. Millard, acknowleged the following contributions to the Museum since the last meeting :—

Contribution.	Locality.	Donors.
Indian Marten (*Mustela flavigula*).	Kulu	General Osborn.
Jackal (*Canis aureus*)	Bunder Abbas ..	Capt. Rae.
Jungle Cat (*Felis chaus*) ..	Cannanore ..	Major H. R. Baker.
Swayne's Hartebeest (*Bubalis Swaynei*).	Somaliland ..	Capt. A. H. Mosse.
Phillips Dik-Dik (*Madoqua Phillipsi*).	Do. ..	Do.
Speke's Gazelle (*Gazella spekie*) ..	Do. ..	Do.
Pelzeln's Gazelle (*Gazella pelzelni*).	Do. ..	Do.
Sœmmering's Gazelle (*Gazella sœmmerringi*).	Do. ..	Do.
Waller's Gazelle (*Lithocranus walleri*).	Do. ..	Do.
Clarkes' Gazelle (*Ammodoreas clarkei*).	Do. ..	Do.
Baiza Orix (*Oric beiza*)	Do. ..	Do.
Greater Koodoo (*Strepsiceros capensis*).	Do. ..	Do.
Gaur's (*Bos gaurus*) head ..	Kanara ..	Anonymous.
1 Himalayan Striped Squirrel (*Funambulus macclellandi*).	Darjeeling ..	E. A. D'Abreu.
2 Bats and young rat, sp. ? ..	Do. ..	Do.
3 Painted bats (*Cerivoula picta*).	Shwebo ..	Major Delme Radcliffe.
41 Bird skins, including *Aquila hastata, Siphia hyperthia, Aegithaliscus erythrocephalus, Turdus viscivarus, Merula unicolor.*	Himalayas ..	S. L. Whymper.
1 Altai Accentor (*Accentor himalayan*).	Simla	P. T. L. Dodsworth.
1 Malabar. Pied Hornbill (*Anthracoceros coronatus*).	Kanara ..	T. R. Bell.
3 Eggs of Common Sandgrouse (*Pteroclurus exustus*).	Cutch	H. H. The Rao of Cutch.
2 Brown-headed Gulls (*Larus brunneicephalus*).	Cannanore ..	Major H. R. Baker.
2 Indian Monitors (*Varanus bengalensis*) alive.	Dharwar ..	T. H. Abraham.
A number of toads and frogs ..	Cannanore ..	Major H. R. Baker.
3 Mosquito-eating fish (*Anabas scandens, Haplochilus lineatus* and *Polyacanthus cupanus*).	Salsette ..	Dr. Bentley.
A large number of Diptera, Hymenoptera, Hemiptera, Orthoptera and Neuroptera.	S. India ..	E. E. Green.
A large number of Lepidoptera, in papers, mostly new to the collection.	Various ..	Capt. W. H. Evans, R.E.

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Contribution.	Locality.	Donors.
Several beetles	Maymyo ..	J. H. Lace.
1 Snake, several fish, echinoderms and crustaceans.	Bay of Bengal ..	Dr. W. Forsyth.
Some Lepidoptera and Coleoptera.	Palni Hills ..	Dr. T. V. Campbell.
74 Beetles	Dera Ismail Khan	Lt. R. T. Francis.
A collection of butterflies ..	Kashmir ..	T. R. Bell.

Minor Contributions.—Mrs. Dimmock, Miss Goldney, Mrs. Swinhoe, Dr. Deane, Majors Girvin and O. A. Smith, Lt. Jenkins, R.G.A., Messrs. C. E. Durnford, L. H. Savile, C. Hudson, I.C.S., H. S. Wise, A. H. Marshall, P. Briscoe, J. Clarke and Messrs. Murray Brothers.

EXHIBITS.

The Secretary drew the attention of Members to the valuable contribution which Capt. A. H. Mosse had made to the Society consisting of 9 heads of gazelles, etc., from Somaliland. These heads having been mounted by one of the leading taxidermists in England were a great acquisition to the Museum and it was to be desired that other Members would follow Captain Mosse's example and provide the Society with a good specimen of the male and female of each of the Indian game animals.

Col. W. B. Bannerman, I.M.S., exhibited a brood of young live Phoorsas (*Echis carinata*) which were born in the Bacteriological Laboratory at Parel on 15th June 1910. The cage was one which contained 8 adult Phoorsas.

THE PIED-CRESTED CUCKOO.

Mr. Kinnear exhibited some skins and eggs of the Pied-Crested Cuckoo (*Coocystes jacobinus*) and remarked that every year in the latter part of the hot weather there appears to be a large influx of Pied-Crested Cuckoos into Bombay and the surrounding district. They generally made themselves noticeable about the first week in June and were not in evidence after the end of the rains. He mentioned that this Cuckoo was found all over India, but in many places it was according to Blanford "either met with only during the rains or more abundantly at that period."

During the last three weeks quite a number of examples had been brought into the Museum, which for the most part had been rescued from the attacks of crows, who seem to have a special dislike to this bird. He asked why should crows be so persistent in their attacks on this apparently to them harmless cuckoo? It could not surely be from any fear of the cukcoo laying in their nests since there is no record of an egg being found in the crow's nest, that of the larger Babblers *Argya* and *Crateropus*, as a rule

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being chosen though sometimes that of a laughing thrush is selected, and Mr. Stuart Baker has recorded two instances where eggs were found in the nest of a small Nepal babbler (*Alcippe nepalensis.*) It might, however, be worth mentioning that a cuckoo belonging to the same genera, the spotted cuckoo *C. glandarious* of S. Europe and N. Africa, lays its eggs in the nests of crows and magpies. Crows were, of course, always ready to mob any strange bird ; for instance, two weeks ago an Indian Pitta, halting on migration, was rescued from their clutches in the University Gardens and brought to the Museum. A crested cuckoo can, however, hardly be called a strange bird after the first few days of its arrival, and the crows must surely have some other reason for mobbing it. He suggested to members that they should endeavour to note when last Pied-Crested Cuckoos were seen at the end of the rains, and that those who happened to be in the country in the neighbourhood of Bombay, during the cold weather might keep a look-out for this species and report its occurrence. He added that any observations which might help to elucidate the cause of the great antipathy which crows have for Pied-Crested Cuckoos would always be of interest.

PAPER READ.

Note No. 2 on the giant water-storing Climber (*Calycopteris floribunda*) Lamk, by Lt.-Col. K. R. Kirtikar, I. M.S. (Retd.), with a microscopic demonstration of sections of the plant by Prof. V. N. Hate, B. Sc.

PROCEEDINGS

OF THE MEETING HELD ON THE 25TH AUGUST 1910.

A Meeting of the Members of the Bombay Natural History Society took place on the 25th August 1910 at the Society's Rooms, Major C. R. Hoskyn, R.E., presiding.

The election of the following 47 new members since the last meeting was duly announced:—Mr. Kawasji Dadabhoy Dubash (Bombay); Mr. E. W. Lace (Waltair, Vizagapatam Dist.) ; Dr. A. G. H. Smart, M.B. (Kelanton *via* Singapur) ; Mr. M. M. Wadia (Bombay) ; Mr. E. A. D'Abreu (Kurseong) ; Mr. J. H. Manning Fox (Barrackpore) ; Mr. I. W. Stokes (Bombay) ; the Mess President, 1st Connaught Rangers (Dagshai) ; Mr. G. H. Welchman (Parlakimedi, Ganjam Dist.) ; the Mess President, 101st Grenadiers (Mhow) ; Mr. Joston Homfray (Gauhatti, Assam) ; Mr. James I. Smith, I.C.S. (Koraput, Vizagapatam Dist.); Mr. J. A. Anderson (Rangoon); Mr. A. de C. Carson (Jaffna, Ceylon) ; Mr. A. J. Kilmartin (Jaffna, Ceylon) ; Mr. K. M. Balfour (Jhansi) ; the Mess President, 41st Dogras (Cawnpore) ; the Director, Dept. of Agriculture (Eastern Bengal and Assam) ; Lt. L. H. L. Mackenzie, I.M.S. (Bombay) ; Mr. J. H. Smith (Bhuj) ; Mr. P. N. W. Wilson (Jubbulpore) ; Mr. H. M. Hope-Johnston (Jubbulpore) ; Major J. R. Carter (Jetalsar, Kathiawar) ; Mr. W. A. Nicholetts (Tejpur, Assam) ; Mr. D. S. Withers (Sibsagar, Assam) ; Mr. N. Macmichael, I.C.S. (Chatrapur, Ganjam

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Dist.); Mr. J. W. Glasson, I.C.S. (Bhadrachalam, Godaveri Dist.); Capt. A. E. St. V. Pollard (Wellington, Nilgiris); Mr. J. H. B. Shand, I.M.S. (Bombay); The Economic Botanist to the U. P. Government (Cawnpore); The Honorary Secretary, King Edward Library (Rawalpindi); the Deputy Director of Agriculture (Mandalay); Mr. F. J. Parton (Koppa, P.O., Kadur Dist.); Mr. J. R. Lemarchand (Kookila Mook, Assam); Capt. A. W. Howlett, I.M.S. (Bombay); Mr. E. D. Sampson (Hubli); Mr. Hugh A. Lomas, I.C.S. (Mussoorie); Mr. A. P. Davis (Mandalay); Mr. W. J. Stanbridge (Kasauli); Dr. N. Annandale (Calcutta); Mr. Charles Cole Barker (Tezpur); Mr. Seymour C. G. Wood (Bombay); Mr. E. W. Bolitho (Neemuch); Capt. O. Kennedy-Crawford-Stuart (Myitkyina, Burma); Mr. A. H. D. Barron (Manipur); Mr. G. S. Hart (Nagpur, C. P.); and Mr. A. Winbush, I. F. S. (Salem, Madras Presidency).

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following contributions to the Museum since the last meeting:—

Contribution.	Locality.	Donor.
Skin and skull of Wild Dog (*Cyon dukhunensis*).	Kanara ..	T. R. Bell.
Skin and skull of Mountain Fox (*Vulpes montana*).	Rawalpindi ..	A. W. Mercer.
Deformed Marmot's skull ..	Kashmir ..	A. F. Brooke, R.F.A.
17 Birds' skins, 2 Flying Squirrel skins and 1 Marmot skin.	Chitral.. ..	Major F. Wall, I. M. S.
7 Bird skins	Toungyi, Burma..	Capt. S. Lightfoot.
Albino Hoopoe (*Upupa indica*) ..	Amballa ..	A. F. Brooke, R.F.A.
4 Eggs of Ibis Bill (*Ibidorhynchus struthersi*).	Bhagirthi ..	S. L. Whymper.
Eggs of little Bittern (*Ardetta minuta*).	Kashmir ..	Major J. Elgee.
Great Indian Reed Warbler (*Acrocephalus stentoreus*), Bronze-winged Jacana (*Metopidius indicus*) and nest of *A. stentoreus*.	Do. ..	Do.
2 Snakes (*Zamenis rhodorachis* and *Tropidonotus tesselatus*).	Muhummerah, Persian Gulf.	Lt. A. T. Wilson.
7 Snakes (*Xenopeltis unicolor*, *Zamenis mucosus*, *Lachesis gramineus*, *Dip. multimaculata*, &c.)	Toungyi, Burma..	Capt. S. Lightfoot.
A number of Frogs and Toads ..	Cannanore ..	Major H. R. Baker.
A small collection of Butterflies..	Kashmir ..	T. R. Bell.
A small number of Beetles and other insects.	Haka, Chin Hills..	F. E. W. Venning.
12 Crustaceans (in exchange) ..	Various ..	Indian Museum.

Minor Contributions.—Mrs. Millard, Mr. E. R. H. Jackson, Dr. D. A. Turkhud, Mr. V. Joshi and Mr. G. Wilson.

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CONTRIBUTIONS TO THE LIBRARY.

Mr. B. D. Richards, the Honorary Librarian, drew attention to the four Volumes of "Reichenbachia" by F. Sander, which Lt.-Col. K. R. Kirtikar, I.M.S. (Retd.), had kindly presented to the Society's Library and the beautiful coloured plates of Orchids were greatly admired by all present.

JOURNAL.

The Secretary mentioned that the next number of the Journal was in the press and would contain, amongst other coloured illustrations, three in connection with "The Game Birds of India" by Mr. Stuart Baker. They would be, the Woodcook, the Eastern Solitary Snipe and the Wood-Snipe. He was glad to say that a number of new members were joining in consequence of this series, and doubtless when others saw the beautiful illustrations, they would join the Society so as to obtain the journal. The Society spare no expense in obtaining the best sketches and illustrations which could be had.

EXHIBITS.

The attention of members was drawn to the specimen of Indian Lion which had been presented to the Society by H. H. The Nawab of Junagadh, G.C.S.I., through the kindness of Mr. C. H. Hill, I.C.S., C.S.I., C.I.E. This specimen which has only just arrived from England has been excellently mounted and proves a valuable addition to the Society's Museum, particularly so now that there are so few Lions left in India.

Capt. Patton, I.M.S., exhibited a common Indian Fruit Fly breeding in Oranges and made some remarks in connection with it.

Dr. Bentley and Capt. Taylor, I.M.S., showed their new method of mounting Mosquitoes.

PAPERS READ.

The following papers were then read :—

1. A new method for making permanent preparations of mosquitoes with demonstrations by Dr. C. A. Bentley and Capt. J. Taylor, I.M.S.
2. The Kathiawar Lion by Lt.-Col. L. L. Fenton.

The Secretary said that through the good offices of Mr. C. H. Hill, I.C.S., and Major J. B. Carter, of Jetalsar, the Society had been able to obtain some excellent photographs of a large Indian lion, which is in captivity in the gardens at Junagadh. These photographs show how the mane grows when the animal is kept in confinement and bears out the contention that the mane is destroyed in wild specimens, because of the thick jungle in which they are found.

These photographs will be published in the Society's journal with the above paper.

A vote of thanks was passed to the authors of the papers read, and the meeting then terminated.

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EXTRACTS FROM THE PROCEEDINGS OF THE BALUCHISTAN NATURAL HISTORY SOCIETY HELD ON 28TH OCTOBER 1909.

Read list of donations made to the Museum during the month, the specimens themselves being passed round for inspection. Of these the most important were :—

A fine Mahseer, from the Beji river near Babarkach, presented by Major A. L. Jacob.

A Beech Marten, from the Brewery, Quetta, presented by Mr. F. W. Starnack.

A Stone Curlew, from Saranan, presented by Mr. G. L. J. Davis.

A Himalayan Solitary Snipe, from Kowas Tangi near Ziarat, presented by Lieutenant Leared.

Two Rock Thrushes, from Quetta, presented by Mr. J. W. N. Cumming.

A Leopard skin, from Mangi, presented by Mulla Alif.

In addition to the donations received during the month, the Python (*Python molurus*), Cobra (*Naia tripudians*), and Double-Headed Snake (*Eryx johnii*), exhibited alive by Mr. Flynn at the last meeting and which had since been killed and mounted by Mr. Flynn, were also passed round for the inspection of such of the Members absent on that occasion; while Mrs. Drake exhibited a curious pair of Markhor horns found on the Murdar range in which one of the horns was of the close spiral type and the other had open curls like that of the Astor type.

Read letter No. 633, dated 9th October 1909, from Mr. Maxwell-Lefroy, stating it was impossible to identify the *Psychidæ* larvæ presented by Mr. Dracott, but that he would do so later, if any of them developed into moths.

The Hon'ble President then concluded the meeting with a few remarks. He suggested that the Sambar Head and other exhibits not of local origin which had been placed in the Museum be kept apart. He desired that the thanks of the Meeting be conveyed to Mulla Alif for the Leopard skin he had sent in and expressed a hope that it would not be long before another would be secured. He further referred to the appeals read at the last Meeting and expressed the hope that members would respond by sending in their observations on the arrival and departure, etc., of Woodcock and Snipe and the migration of birds in general, and expressly asked that advantage be taken of the present shooting season to secure and send in specimens of snipe, grouse, duck, hare, etc.

In conclusion he mentioned that when passing through Bombay on his return from leave, the Honorary Secretary, Bombay Natural History Society, desired him to thank the Members of the Baluchistan Natural History Society for their help to the Bombay Natural History Society.

25th November 1909.

Read list of donations made to the Museum during the month, the exhibits themselves being passed round. Of these, the most important were—

A Jackdaw, from Baleli, presented by Master Walter Cumming.

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A Fossil (*Amblypygus altus* ?), from Manzai, presented by Col. C. W. Jacob.

A Red-tailed Chat, from Kaliphat, presented by Lt. G. T. Raikes.

Three specimens of *Pyrrhocoris apterus* (?) found by Mr. Dracott in a fissure in a rock and in a building at Hanna.

The Honorary Secretary brought to notice the rarity of the Jackdaw and the Red-tailed Chat, remarking that the existence of the former in Baluchistan had not previously been recorded, while Major Gough remarked that he had also seen some recently.

Read letter, No. 1874, dated the 3rd November 1909, from Mr. I. H. Burkill, M.A., Offg. Reporter on Economic Products to the Government of India, Calcutta, intimating that the specimen of Artemisia (vernacular "Tirkha") sent to him had proved, on examination, to be *A. maritima*, and that the white tufts on the plant are the work of insects.

Read letter, dated 6th November 1909, from Mr. N. B. Kinnear, Keeper of the Museum, Bombay Natural History Society, intimating that the Snipe sent to him for identification was *Gallinago solitaria*, the Himalayan Solitary Snipe, and that it tallied with a bird received by the Society recently from Garhwal, the absence of any black on the head and of the pale median stripe on the crown being doubtless due to its being a young bird.

21st December 1909.

Read list of donations received and purchases made by the Museum since the last meeting, the objects themselves being passed round for inspection.

Of these, the most important were—

A Hyæna, from Gulistan, presented by S. B. Haji Ghulam Hyder Khan.

A large Cormorant, from Khushdi Khan Ban, presented by Lt. R. M. Jacob.

Two Bramblings, from Quetta, presented by Lt. A. M. Lloyd.

A Barnes's Chat, from Baleli, presented by Master Arthur Cumming.

A copy of a work entitled "Insect Intruders in Indian Homes" by Mr. E. P. Stebbing.

A painting by Mrs. Dracott, of two wild plants found growing at Hanna.

Read letter, No. 939, dated 2nd December 1909, from Mr. H. Maxwell-Lefroy, M.A., F.E.S., F.Z.S., Imperial Entomologist, Agricultural Research Institute, Pusa, forwarding three moths which had come out of some of the cases found by Mr. Dracott at Hanna and referred to in the Society's Proceedings of 22nd October 1909, and stating that they are undescribed in the Fauna of India and are probably new to science.

27th January 1910.

Read list of donations made to the Museum since the last meeting, the

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specimens themselves being passed round for inspection. Of these, the most important were—

A Brambling from Quetta, presented by Master Bertie Smith, and a beautiful male Smew, from Nushki, presented by Major F. C. Webb Ware, C.I.E.

A copy of Lepidoptera Indica, Part LXXX, by Colonel C. Swinhoe, M.A., F.L.S., F.Z.S., presented by the Government of India in the Home Department.

A number of shells belonging to the Quetta Museum which had been kindly identified by the Indian Museum, Calcutta.

Various specimens of Mollusca, Lizards, Fish, Coleoptera, Hemiptera, Neuroptera and Diptera, presented by the Indian Museum, which formed a most interesting and welcome addition to the exhibits on view.

A set of coloured plates of insects presented by Mr. H. Maxwell-Lefroy, M.A., F.E.S., F.Z.S., Imperial Entomologist, Agricultural Research Institute, Pusa.

List of botanical specimens contributed by the Baluchistan Forest Department to the Museum, prepared originally by R. B. Bhai Sadhu Singh, Retired Extra Deputy Conservator of Forests, and now revised by Lala Mulraj, the present Extra Assistant Conservator of Forests in Baluchistan.

Some observations on bird migration made at or near Quetta and communicated to the Honorary Secretary during the month, were then read.

24th February 1910.

Read list of the zoological donations made to the Museum since the last meeting, the objects themselves being passed round for inspection.

Of these, the more important were—

A Brandt's Rose Finch, obtained in Quetta, by Master H. Smith.

A Himalayan Griffin, obtained in Quetta, by Master C. Anscomb.

A Griffin Vulture, obtained in Quetta, by purchase.

A female Smew, from Saranan, presented by Mr. A. Sisson.

A fine Golden Eye, from Saranan, presented by Mr. G. L. J. Davis.

31st March 1910.

Read list of donations made to the Museum since the last meeting, the objects themselves, which were numerous, being passed round for inspection. Of these, the most important were—

A valuable collection of the Sea Shells, etc., from the Persian Gulf, presented by Mr. F. W. Townsend, Chief Officer, I.G.T. Str. "Patrick Stewart."

An Afghan Jerboa, from Quetta, presented by Master Bertie Smith.

Two Ruffs, from Baleli, presented by Master Walter Cumming.

A Strickland's Chat, from near Baleli, presented by Mr. J. W. N. Cumming.

Several Flamingo, from Khushdil Khan Abigum and Nari Bank, presented by Captain D. I. Shuttleworth, Mr. Wood and Mr. L. 'Esteve.

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A Great Black Headed Gull in winter plumage, from Saranan, presented by Mir Ahmed Khan.

A Rock Sparrow, from Quetta, presented by Lt. A. M. Lloyd.

An Allied Grey Shrike, from Kuchlak, presented by Corporal Bridger and Private Hudson.

An Eastern Calandra Lark (?), from Baleli, presented by Corporal Bridger and Private Hudson.

An exceptionally fine collection of Duck, etc., obtained, with two exceptions, from Khushdil Khan, *viz.*—

A Gadwall, from Baleli, presented by Lt. P. Shepherd.

A male Pochard or Dun Bird, from Saranan, presented, by Mrs. S. D. Turner.

A female Pochard or Dun Bird, presented by Lady McMahon.

Three Shovellers, presented by the Hon'ble Sir Henry McMahon and Majors Cobbold and Gough.

Two Pintail Ducks, presented by Lt. H. C. Finnis.

A Wigeon, presented by the Hon'ble Sir Henry McMahon.

A Golden Eye, presented by Major E. C. Cobbold.

A White-Eyed Duck, presented by Mr. Bartholomew.

A female Mallard, presented by Captain W. J. Maxwell-Scott.

A Pelican, presented by Miss Elliott.

A pair of Great, Crested Grebe, presented by Colonel Woodyatt and Major Gough.

In addition to the above, three paintings by Mr. S. D. Turner of a wild plant, and a painting by Miss Anscomb of some wild Tulip Flowers, were also passed round.

28th April 1910.

Read list of donations made to the Museum since the last Meeting, the objects themselves being passed round for inspection. Of these, the most important were :—

A collection of 31 species of named Diptera, presented by the Indian Museum, Calcutta.

A fine lizard, from Mach, presented by Mr. E. Wood.

A Krait, from Fort Sandeman, presented by Major C. H. Ward.

A Booted Eagle, from Quetta, presented by Major H. Gough.

A lovely Red-headed Bunting, from Quetta, presented by Lt. A. M. Lloyd.

Specimens of Iron Pyrites, Crystalline, Limestone, Chromite, Manganese Ore and Magnesite, from Hindubagh, and of Halotrichite (Iron Alum) from Harnai, presented by Mr. W. C. Clements ; and lastly

A fine collection, presented by Mr. F. W. Townsend, of Marine Fauna, from the Mekran Coast with a long length of Cable laid in 1886 covered with shells.

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Read following extracts from letter, dated the 16th April 1910, from Major F. C. Webb Ware, C.I.E. :—

"In the year 1907, when passing the same place (along Trade route between Nok Kundi and Tratoh) I picked up alive, but with broken wings, three duck and one teal, and the levies who carry the mail tell me that this place is an almost certain find for maimed duck, etc., at a certain season of the year. The matter is of some little interest, as it would tend to show that under certain circumstances, firstly, birds flighting at night keep far closer to the ground than is perhaps generally supposed; and, secondly, that they favour certain definite paths of flight, being guided in these by the surface conditions of the ground over which they fly.

"Although scarcely falling within the limits of Natural History research, I think that it also interests some of your members to learn that measurements were taken last year to ascertain the rate of progress south of the Sand Barkans, which cross the Trade route between Chah Sandan Tratoh and from the connection between the Sandy desert north of the Koh-i-Sultan Range and that lying west of Kharan, and it was found that the progress made was 100 feet. It is more than probable that the distance these Barkans cover varies according to the year and it may be noted that common report has it that the winds which blow across this stretch of country from the north were last year rather below their normal strength."

In addition to the above observations on bird migration, Mr. Clements remarked that he had once seen a brown Cobra at Khost. This was confirmed by the Hon'ble President, who stated that he had seen Cobras at Sharigh, and remarked that one had also been secured at Duki. He added that one of Col. Drake's servants was bitten by a Cobra in Quetta and died in about 25 minutes, but it is very doubtful whether the snake belonged to these parts.

The Hon'ble Sir Henry McMahon further mentioned having seen during the week large numbers of tortoises, 5 and 6 together, along the Railway track between Quetta and Nushki and again between Quetta and Chaman.

The Honorary Secretary then passed round, for the information of the members, a set of 4 volumes of Seebohm's "History of British Birds" purchased by the Museum during the month.

In conclusion, the Hon'ble President proposed that a special vote of thanks be conveyed to Mr. F. W. Townsend for his very valuable gifts to the Museum, and urged upon more of the members to record their observations as to the migration of birds, those already received being most useful. He also impressed upon members the necessity for reporting the exact locality where found when sending specimens to the Museum, this being especially important in the case of snakes and fishes.

J. W. N. CUMMING,
Honorary Secretary.

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JANY. 1911. VOL. XX. No. 3.

THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.

PART III.

(With Plates A, B & C and Maps A & B.)

(Continued from page 278 of this Volume.)

Family—CHARADRIIDÆ.

Genus—GALLINAGO.

GALLINAGO CŒLESTIS.

The Common or Fantail Snipe.

Scolopax gallinago.—Linn., Sys. Nat., i., p. 244; Seebohm, Geogr. Distr. Charadr., p. 484; *id*, B. Jap. Em., p. 346.

Scolopax sabinii.—Vigors. Trans. Linn. Soc., xiv, p. 557. Irish Naturalist, Jan. 95, Barrett-Hamilton.

Gallinago scolopacina.—Blyth, Cat. B. Mus. As. Soc., p. 272; Jerdon, B. of I., iii, p. 674; Godwin Austin, J. A. S. Bengal, xxxix, p. 273; McMaster, *ibid*, xl., p. 215; Blanford, *ibid*, p. 276; Hume, Nests and Eggs, Indian Birds, p. 586; *id*, Str. F. I., p. 235; Adam, *ibid*, p. 395; Hume, *ibid*, ii, p. 295; Parker, *ibid*, p. 335; Hume, *ibid*, iii, p. 182; Blyth, B. of Burm., p. 156; Blanford, East Pers., ii, p. 282; Butler and Hume, Str. F., iv, p. 15; Scully,

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ibid, p. 186; Fairbank, *ibid*, p. 439; Hume and Dav., *ibid*, vi p. 459; David and Wen., *ibid*, vii, p. 88; Ball, *ibid*, p. 228; Legge B. of Cey., p. 821; Murray, Vert. Fauna Sind, p. 240.

Gallinago gallinago.—Sharpe, Cat., xxiv, p. 633; *id*, Hand-List, B., i, p. 165; Oates, Game B. Ind., ii, p. 455; *id*, Cat. Eggs B. M., ii, p. 61.

Gallinago gallinaria.—Cripps, Str. F., vii, p. 302; Hume, *ibid*, viii, p. 70; Bingham, *ibid*, p. 196; Scully, *ibid*, p. 255; Butler, Cat. B. of Sind, p. 61; *id*, Cat. B. S. Bom. Pres., p. 76; Vidal, Str. F., ix, p. 84; Bingham, *ibid*, p. 196; Reid, *ibid*, x, p. 86; Barnes, B. of Bom., p. 345.

Gallinago cœlestis.—Hume and Mar., Game Birds, iii, p. 359; Butler, Str. F., ix, p. 428; Barnes, *ibid*, p. 459; Davidson, *ibid*, x, p. 320; Hume, *ibid*, p. 413; Oates, B. of B. B., ii, p. 381; Hume, Str. F., x, p. 413; *id*, *ibid*, xi, p. 321; Blanford, Fauna, B. I., iv, p. 286; Finn. Indian Waders, p. 144; Bahr, P. Z. S., p. 12; Butler, B. N. H. S. Journal, xii, p. 427; Stuart Baker, *ibid*, p. 501; Wilson, *ibid*, p. 641; Rattray, *ibid*, xvi, p. 695.

The Snipe.—The "Times" 26th December 1908, 27th August 1909.

Vernacular Names.—*Chaha* or *Chaha chiriya* (Hin.); *Chegga*, *Khada-Kocha* (Bengali); *Kocha Sorai*, *Chaha-Sorai*, *Chergya* (Assamese); *Bharak* (Nepal); *Chek-lonbi* (Manipur); *Myay-woot* (Burm.); *Chaha-charai* (Ooriya); *Tibud*, *Pan-lawa* (Mahr.); *Mor-ulan* (Tam.); *Muku-puredi* (Tel.); *Kaeswatuwa* (Cingalese); *Daodi-dap* (Cachari); *Vok-ti-alin* (Kuki); *Ti-inrui* (Naga).

Description.—*Adult male.*—Crown to nape dark brown or blackish brown, with a few specks of pale rufous; a broad median stripe and broad superciliaries reaching back to the neck pale rufous; a line from the bill through the eye and over the ear coverts dark brown; sides of the head rufous speckled with brown; neck rufous blotched with brown and with two fairly definite lines of brown on lower throat and neck; chin and upper throat plain unspotted rufous. Back velvety black, the scapulars with broad, pale rufous edges, which form a longitudinal line down each side of the back. Upper back much speckled and barred with rufous, lower back barred with pale rufous, upper tail coverts rufous barred with wavy lines of

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black and with obsolete shaft streaks; tail black with narrow rufous bars and a broad terminal band. Lesser wing-coverts brown, tipped rufous, median coverts barred with rufous and brown and greater coverts brown with white tips. First primary brown with a white outer web, other primaries brown with narrow white tips, increasing in width on the innermost; secondaries barred brown and black and mottled with white on the inner web. Breast dull buff or brownish, with dark brown bars; flanks the same; abdomen white; undertail coverts rufous or buff and brown, the former colour predominating. Lesser underwing coverts white, much barred with brown, principally so on the edge of the wing; median underwing coverts white, seldom with any barring at all, greater coverts brown with a broad white edge; axillaries white more or less barred with brown.

"Bill rufous brown, paler at the base; irides deep brown, legs olive-green. Tail feathers 14 or 16 in number" (Blanford).

"The bills have the terminal one-fourth or more deep brown to blackish; the rest pale brown or horny brown with a yellowish tinge, dark along the edges, often brownish green just at the base of the upper mandible, and generally yellowish or yellowish green or olive, on the basal fourth (more or less) of the lower mandible; the irides are deep brown, almost black; the legs and feet are ordinarily greenish, often pale olive green or greenish olive; and as the season advances they acquire a stronger yellow tinge, the legs of birds killed in April and May being often a distinct yellow green; there is often a dusky shade over the joints and the claws are deep brown to black" (Hume).

"Length 9·0 to 10·3; expanse 15·0 to 17·5; wing 4·9 to 5·6; tail from vent 2·5 to 2·9; tarsus 1·20 to 1·34; bill from gape 2·39 to 2·7; at front 2·43 to 3·75; weight 3·3 oz. to 5·1 oz.; average 4·15 oz." (Hume).

Adult female.—"Total length 10·5 inches, culmen 2·8, wing 5·3, tail 2·45, tarsus 1·3" (Sharpe).

The female does not differ from the male in colouration but is a rather larger bird.

"In this species also the females do average slightly larger and have longer bills than the males."

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"Length 9·2 to 12·5; expanse 16·0 to 18·25; wing 4·9 to 5·71; tail from vent 2·3 to 3; tarsus 1·25 to 1·33; bill from gape 2·5 to 2·9; at front 2·62 to 3·0; weight 3·1 to 5·5 oz.; average 4·27" (Hume).

"*Young.*—Differs from the adult in being more rufous, especially on the throat and neck. The black markings of the back are more broken up and mottled with rufous bars, and the pale outer bands along the scapulous are not so wide" (Sharpe).

Nestling.—Pale fawn tinged with rufous above and fading almost to white on the underparts. Upper parts mottled with deep brown, or blackish brown; wing with two dark bars and head with the orbital streak and bars on the head well defined.

The above description is taken from a Cashmere nestling, and nestlings from England appear to be brighter and more chestnut. All nestlings have tiny silvery tips to many of the feathers.

There is a form of the Fantail which has been honoured with a separate name and called Sabine's Snipe (*Gallinago sabinii*) but which is now recognised by all ornithologists as being merely a melanistic form. The home of this is in Ireland whence specimens extend to England in some numbers, one also having been obtained in Scotland and one on the Continent. In the "Irish Naturalist" for January 1895 Barrett-Hamilton has written an article on Sabine's Snipe in which he accounts for no less than 55 specimens of which 31 were obtained in Ireland and 22 in England. The only record of its occurrence in India is made by Finn in his "Indian Waders," in which he says "a fresh specimen of a snipe was brought to me for identification which was an undoubted example of this form."

A comparatively far more common variation in India is the pale form, one cannot call them albinistic as they are not true albinos. Even this, however, is very rare. Mr. W. K. Dods, who has shot many thousands of snipe, has never found one, and in 28 years-shooting in India I have been no more lucky.

The Indian Museum has five specimens of this pale snipe. They are all of a very pale fawn, almost white, ground colour and have the usual markings, but all of a pale fawn or rufous fawn tint. With the exception of one bird all have the bill and feet normally

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coloured and one bird has also some normal feathers, on the upper plumage, which are new shewing that it would probably have moulted into the ordinary plumage.

There is one specimen with pale feet and bill, probably therefore a permanent pale type, but the colour of the irides is not mentioned on the ticket.

In addition to the above specimens there is one which has part of its plumage dark and part pure white ; even this, however, is not true albinoism as the bill is dark as well as the feet and the white plumage is most probably due merely to some injury.

In the possession of the Bombay Natural History Society there are three more of these pale snipe but one of them has numerous feathers on the back and scapulars with normal coloured patches upon them and the tail also is practically normally coloured; this bird, which was obtained by Major Harrington in March 1896 at Meerut, is in full unabraded plumage and it is impossible to say whether it is in course of losing its colouration or commencing to reacquire it.

A fourth, and far more interesting specimen, is one sent by Mr. N. Z. Nicholas from Scind. In general plumage this is the palest bird I have seen but the median and greater wing coverts are normal as are the quills and under-surface of the wings, including the axillaries. This probably is a specimen which has originally lost its colouring through shock or injury and is now gradually recovering. The feet of this bird are distinctly dark and the beak appears also to have been so in life.

There is a very beautiful specimen of the Fantail in the Indian Museum, recently presented by Messrs. Manton & Co. and procured in the vicinity of Calcutta, which is of a still more rare form than either the pale or melanistic variety. From this bird every atom of red colouring has been eliminated and the consequence is that the whole plumage consists of various tones and shades of grey, ranging from pure white on the under parts to the deep velvety black of the scapulous. The bird as a whole gives one the impression of being a lovely dark silver grey.

The cause of this bird's colouration is undoubtedly the exhaustion of the rufous colouring pigment. The question of pigmentation as

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applied to plumage is still in its infancy and it is not easy to lay down the law on the subject with our present scanty knowledge Our piebald snipes and other birds generally have the white plumage caused by some local injury which completely checks circulation of all pigment to the part injured, on the other hand the uniformly pale fawn snipe appear to have lost the power of generating the dark pigments and to have their rufous pigment deficient as well. Sickness in many birds causes loss of brilliance in colouration and in some cases actual loss of colour, heat with humidity increases depth and brilliance and a dry sun combined with open country causes excessive evaporation and consequent bleaching.

Distribution.—Sharpe, including *raddei* with *coelestis*, says that its distribution is Europe generally and Northern Asia up to about latitude 70′, migrating south in winter to Senegambia, N.-E. Africa, India, and the Malayan countries, as far as Batchian. It occurs in Greenland but only occasionally in North America, and is accidental in Bermuda.

Within our limits there is no portion of the Indian Empire from East to West and North to South in which the Common Snipe will not be found provided there is suitable country for it. It is, however, less numerous to the extreme south, and is less common in the north-east than is the Pintail and is rare in Southern Burma but straggles into Malaya, and I have lately received a specimen from Siam whence it had not previously been recorded. Mr. Venning informs me that he has repeatedly obtained it in the Chin Hills.

Although the Common Snipe has a breeding range which, if one includes Radde's Snipe, extends completely across Asia yet migration into India undoubtedly takes place to a far greater extent from the west than the east and it would appear that Eastern birds do not as a rule penetrate so far south as the Western. A certain number of Fantails do yearly come into India *via* the great rivers of the East such as the Dihong, Dibong, Brahmaputra and Irrawaddy, but a far greater number come *via* the Western rivers and passes.

As a matter of fact it is not at present at all certain whether

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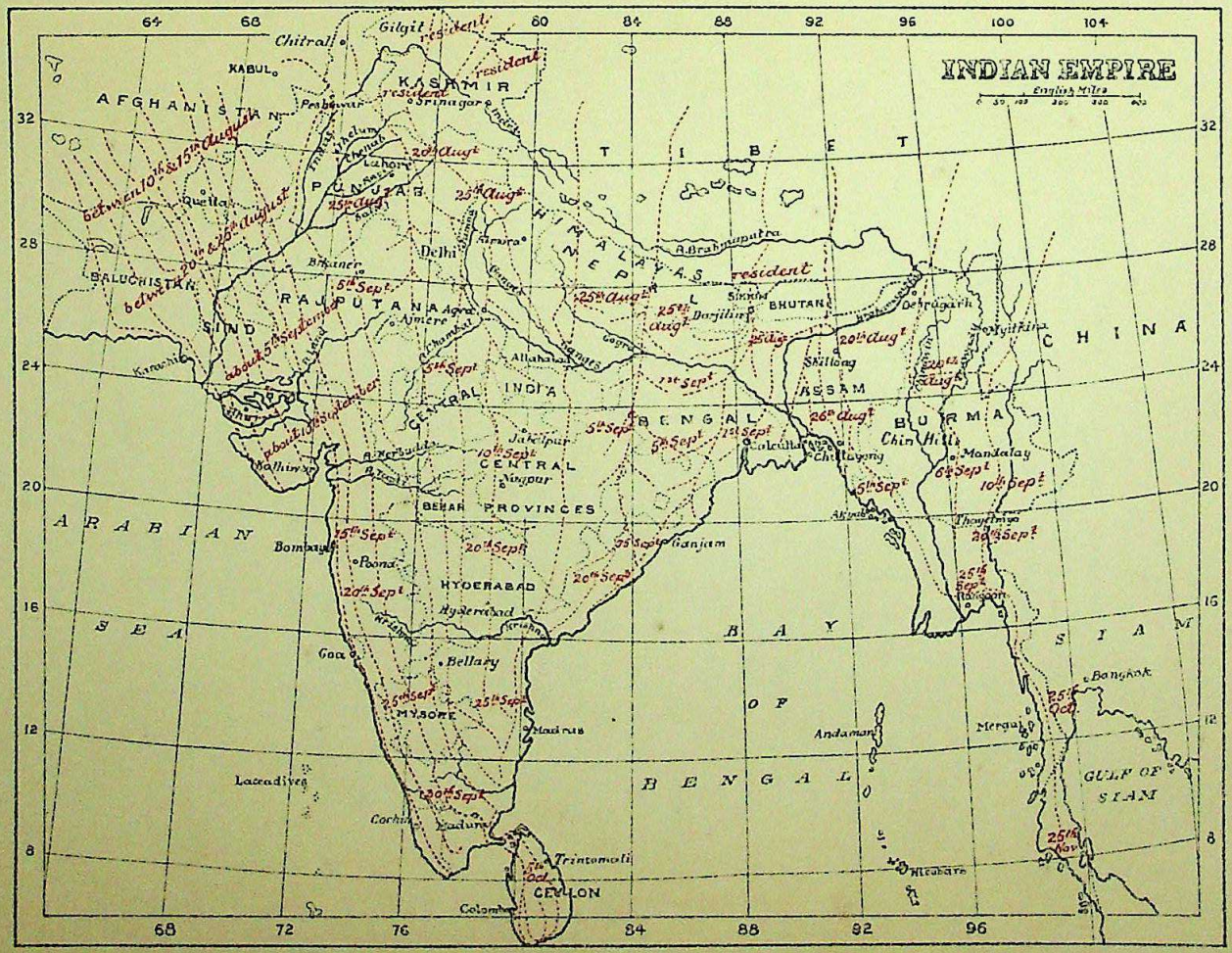

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in their annual migrations snipe, either Fantail or Pintail, do make use of the great waterways and, personally, I am rather inclined to believe that such is not the case. Were it so we should expect to find snipe on their first arrival most numerous in those swamps and rice fields which are situated close to the exits of the big rivers from the Hills; but they are not so found and though I have served some 25 years in the Hills and Plains of Assam my experience goes to prove the contrary. Thus during the seasons of migration snipe are comparatively common in the Khasia Hills wherever there are swamps over 5,000 ft. These hills are situated on the south bank of the Brahmaputra and all these birds must have come straight across the river instead of working along it and thus skirting the hills. In the North Cachar Hills I repeatedly found snipe passing the day on lofty peaks, arriving before daybreak and leaving in the dusk of the evening. Every year in August and in March and April snipe were to be found on the Guilang peak, lying up in the ditch which surrounded the small Fort, this peak being almost 4,000 ft. high. At Hangrum over 6,000 ft., the same thing occurred and once in early August snipe were found absolutely swarming in some scrub jungle on a hill slope just outside the rest-house. The birds were very thin and very tired and so loath to rise that they were easily killed with dust shot and half charges of powder. Again all through the Assam Valley snipe appear to work due north and south and no east and west along the course of the Brahmaputra and it seems probable that in migration snipe and many other waders instead of following the courses of the great rivers work straight across them, from one range to another.

The Fantail Snipe seldom arrives in India until August has well advanced, and even then it will only be found in the extreme North. By early September it has worked as far South as Central Bengal, Bombay and the North of the Central Provinces, but it is not found in any numbers until the middle of that month and it does not usually appear in Madras and Travancore until the end of September and more often still not until the middle of October. Writing from Coorg, Major J. C. Macrae informs me that the first snipe shot in 1908 was on the 14th September and

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in 1909 on the 18th September. Oates long ago wrote "The Fantail does not appear" (in Burmah) "until the cold weather is well in, say in December," but I have records now of birds shot in Southern Burmah as early as September 26th.

In Eastern Assam sportsmen generally try for snipe on the 4th August, and this is the earliest date upon which I know of a Fantail having been killed, but after this there is a long gap and the next earliest was shot on the 26th August. Mr. L. W. Middleton shot a few Fantail in 1909 at Gauhati on the 5th September; at Chittagong a few are annually shot before the end of August, but all that I have *seen* shot there in this month were Pintail and the Fantail must be a *rara avis* before September. In Bengal one *hopes* for snipe on the 1st September but does not always get them even at as Northern a latitude as Calcutta, and many a hot and weary trudge have I had on the first two or three days of September without a chance of firing a shot. In Southern and Central Bengal there are but few birds in before the middle of the month.

Reid says that "the Common Snipe begins to make its appearance towards the end of September" near Lucknow. Doig records their arrival on the Eastern Narra in September. Maitland notes the first snipe shot at Jacobabad on the 28th August. Mr. A. Hosken shot 4 snipes near Secunderabad on the 26th August and Theobold says that they do not arrive in Southern India until October.

As one would expect, the further South the birds go on migration the earlier in the hot weather their departure takes place. Thus in Ceylon they leave in early March and in Western India, Travancore and Madras most birds have left by the end of that month though a few stay on well into April, and Hume says that individuals are to be seen "in the North and South of India in May and June." In North-Eastern India I think few birds stay after the middle of April, but a few are shot now and then even in May. In 1882 I shot three Fantails on the Haripal Bheel near Calcutta on the 24th May; in 1871 Baldwin shot seven and saw many more near the village of Goovsora in Lablatpore on the 2nd May.

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In the *Indian Field* of the 12th May 1904 a correspondent records shooting snipe up to the 3rd May and "Raoul," in the same paper of the 26th July 1909, also records shooting a snipe on the 3rd May.

A few birds stay all the year round in the plains but these do not number one in every ten thousand of those that visit us and are undoubtedly birds which have been wounded and so temporarily incapacitated from long flights. In this category I place the birds shot during May at Haripal and also others which were found breeding in the Sonthal Parganas.

All snipe are more or less nocturnal, or at all events crepuscular, in their habits and their migrations take place almost entirely by night. As a rule moonlight nights are selected for their journeys and at the commencement and end of the migration seasons the constant pénch, pénch, of snipe flying overhead may often be heard although the birds themselves, even on the most brilliant of moonlight nights, may be far too high to be visible.

As sportsmen well know the snipe is very intolerant of sun and in the hotter months, during the heat of the day, most birds seek the shelter of some heavy crop, whilst those who stay in the fields of short rice or in similar places get under the shade of the banks which divide the fields or under some specially rank tuft high enough to afford them some protection.

I well remember on one occasion shooting near Calcutta on a very hot day in early September when still very unversed in the ways of snipe and accordingly failed to work the proper places when the sun got high up. The walking was delightful, thin paddy and ankle-deep mud and water, and from 7 A.M. up to about 9-30 the firing was continuous with a quickly mounting bag. Then suddenly the birds ceased to rise and weary tramping from 10 to tiffin time and again on to nearly 4 P.M. was rewarded with scarce half a dozen shots and these at birds which rose at our feet, generally doubling back at once and affording but difficult shots. After 4 P.M. however the birds seemed gradually to increase again and the last hour's shooting added some 20 couple to our sticks.

Shooting over the same ground by myself a few days later as

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soon as it began to get hot I hunted about for the birds and eventually found that after 10 A.M. they all retired to jute and other high crops, generally resting near the edges of the field, but often being flushed from the very centre. Once inside crops of this sort the birds lie very close and one can almost stamp on them before they move and, even when forced to fly, they do so in a very lethargic manner and soon re-settle. On one occasion in the middle of a hot day in September an orderly of my father's actually caught a snipe in his hand, stooping down and picking it up as we passed along in line. The bird seemed to be uninjured and flew away well and strongly as soon as released. On another occasion I caught a snipe I had seen settle by throwing my *sola topee* over it, but was punished for my smartness by an erratic-firing friend who promptly blew to pieces the *topee* together with its fluttering captive.

Snipe seem to differ curiously in different provinces as to the haunts they prefer. Throughout Bengal one is accustomed to walk them up in the rice fields and though, of course, they also haunt shallow swamps and jheels as well, it is undoubtedly in the rice fields that five out of every six snipe are annually shot. In the Sunderbands we found that our biggest bags were obtained in the middle of the day in the big jheels of deep water, where we had to wade in any depth from our knees to our chests. The snipe got up close to us and appeared in most cases to have been resting *under* the big lily leaves which covered the whole surface of the water.

In Assam it is little use working the rice fields, though on rare occasions decent bags may be obtained in them. Generally the birds are found in weed covered lagoons and jungle fringed tanks where walking is hard and the shooting difficult. In many places in Assam there are wide stretches of water covered with dense masses of floating weed, strong enough to support one for a brief second, yet hardly thick enough to allow one to stand and shoot. In such places I have seen birds so numerous that to get bags of 200 couple all that was required was straight powder which, needless to say, was never to be found when shooting in ground of this description.

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Of Burmah Tickell says :—" Snipe shooting in Burmah or Arakan is a pursuit of pleasure under considerable difficulties. The sport is in its prime long before the country has emerged from the flood of the rainy monsoon, so that Auceps has to wade through paddy fields up to his middle (if not haply higher) and under a sun which blisters his back, before he can make a good bag."

In Upper India Hume records that snipe are to be found "in every swamp or marsh, on the margins of ponds, lakes and rivers wherever there is a more or less muddy foreshore protected by low grass, rush or weed. Of all things they seem to love a kind of rush with a circular stem *(Scirpus carinatus*, I think*)* which is common about the edges of ponds and jheels in the North-West Provinces and which is a sure find for them. In the heat of the day, when *Urher* and similar crops run down to the water edge, alongside some jheel you will often find many snipe in those."

In Southern India they also seem to frequent ponds, jheels and river edges far more than in Bengal, but in many places they also are often shot in large numbers in the rice fields.

Reid notices a fact about snipe which is absolutely correct though not often noticed by sportsmen, and this is that snipe never allow their breast and lower plumage to become really wet or draggled.

There are three questions in regard to snipe shooting which seem to be ever green in their interest to sportsmen, and these three are—(1) is snipe shooting harder in England than in India, (2) what constitutes a good shot, and (3) what constitutes a good bag.

As regards the first question there is, I think, little doubt that, on the whole, snipe are harder to hit at home than in India. There *can* be no doubt that the average snipe at home is wilder, flies faster and twists more than he does out here but, on the other hand, the difference between shooting on a sweltering day in September in the Plains of India and shooting at home on a frosty day is very great indeed and goes a long way to level up the chances between the gun and the bird. As the weather gets colder the bird out here get away quicker and stronger and more nearly approach in their flight their English brethren.

As to what constitutes a good shot it is difficult to say. One

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cannot find out if a man is a good shot by the result of one day's shooting. Sometimes birds seem specially sluggish, the walking is good and the shooter fit so that missing seem harder than hitting; other days birds are unaccountably wild, the walking is deep and treacherous and the powder consequently wasted. Possibly calculating on a whole cold weather's shooting the man who gets one bird to every two cartridges expended may *call himself* a good shot, he who finishes up the season with an average of two in three *is* a good shot, whilst the man with an average of three in four is hard to beat and may consider himself a really crack shot.

The best shooting I have ever *seen* was done by my father Mr. E. B. Baker in 1884 at Hugli. He commenced with 12 consecutive kills, then a miss and 12 more kills, then another miss and 14 kills, and after a third miss yet another dozen birds. This meant 51 birds in 54 shots, and his final bag for the day was 84 birds in 92 shots.

The best shooting I have ever *heard* of, which was properly authenticated, was the performance of Mr. H. Cornish, then Superintendent of Police, Orissa. The shooting was the result of a bet of 25 to 1 that he could not shoot a hundred birds with a hundred cartridges, 10 to 1 that he would not get 96 and 3 to 1 that he would not get 90. Mr. Cornish got up to his 50th bird without a miss and eventually failed by exactly four birds to get his hundred birds in a hundred shots. On this occasion the walking, as might have been expected, was as near perfection as possible, and the birds so numerous that it was never necessary to take difficult shots. Even under these circumstances the shooting was wonderful, and it will be long before it is beaten.

As to what constitutes a good bag, this depends entirely on the locality. In Upper India bags of 100 couple to two or three guns are always possible, but to a single gun bags of anything over 50 would be considered good. In Southern India such bags would be quite exceptional and in Ceylon practically unknown. In Assam a bag of 30 couple is good, though in Sylhet and sometimes in Cachar and Goalpara much bigger bags are obtained. In Bengal however it is every snipe shot's ambition to get 100 couple to his own gun, and though few ever realise this ambition

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many get very close to it and some do even better. The same thing occurs in Burmah, and 100 couple to one gun has two or three times been beaten in that Province,

The honour of making the biggest bag on record belongs to Mr. W. K. Dods who, on the 18th February 1900, shot 131 couple of snipe and a quail. *In epistola* Mr. W. K. Dods writes to me—

"On the 17th February 1900 information reached me that there were a considerable number of snipe on a particular jheel of immense extent about 100 miles from Calcutta where I had already made some good bags. I accordingly started off that night well provided with cartridges in a slow jolting train that eventually deposited me at dawn within an hour's tramp of my destination.

"Some miles walk took me through cultivated country until the landscape, getting gradually more open, brought me to a large swamp tract of country covered with about the worst kind of 'ponk' it has ever been my fate to shoot in, a black reeking mud composed entirely of decayed and decaying vegetable matter in which one frequently sank to one's thighs. Growing in this ooze were dense clumps of hoogola reeds interspersed with fairly open glades, where birds could feed, and with other patches of thin null jungle in which snipe delight to rest during the day, secure from the too pressing attentions of the numerous hawks that infest these marshes.

"Though good for snipe, thin null does not make things any easier for the shooter, already heavily handicapped by the soft and insecure foothold. A snipe dodging through straggling patches of reeds until he gets high enough to feel the wind, only to again start twisting, makes this, in my opinion, the most difficult form of snipe shooting I know of. However, the birds make up in numbers for the numerous and disheartening misses one makes on a ground of this sort, and having been told by my men to expect a bag of 100 couple I came well supplied with ammunition.

"Unfortunately snipe on this particular jheel do not sit well till after 12 o'clock, so I began operations about 8 a.m. on another stretch of equally soft and "stagnant ponk" in which I pounded about till 10-30 getting 14 couple and tiring myself a good deal with

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the heavy going. By 11-30 I was compelled to take another breather, by which time the bag had increased to 24 couple, and as I was now thoroughly disgusted with 3½ hours floundering about in the abominable mud I insisted on being taken on to the good ground—good indeed it was—not swarms of birds rising in wisps of 20 and 30 as one sometimes sees, but evenly distributed in ones and twos all over the place. There were also a considerable number of jack and painted snipe about, but these I tried to avoid shooting, though in the end I got two jacks. These were the result of snapshots taken at birds disappearing over the tall reeds when there was no time to discover one's mistake till after the trigger had been pulled.

"Many dead birds fell amongst the tall hoogola where retrieving them was most troublesome and tiring work for the coolies and, though I had three of my best men out that day, I would not like to say how many birds were lost.

"In spite of these drawbacks, the excellence of the sport and the difficulty of the shooting kept my keenness up till 5 p.m. when I found the men were so used up as to be practically useless and, as I was beginning to go a bit off my shooting myself, I decided to give up. On counting over the birds on the sticks I found 259 common or fantail snipe, 1 pintail snipe, 2 jack and a quail. What the latter was doing in such an uninviting spot it is hard to say, unless it had been driven in to the tall hoogola by hawks. I only once got two birds at a shot that day and was using an ordinary hammerless gun, Schultze powder, No. 8 shot, and last but not least a hand protector.

"Though I have on six other occasions shot bags of over 100 couple on that particular ground this was the last and best. Since then a dense growth of green rushes has spread itself all over the jheel and so covered up the feeding that birds are comparatively scarce though from 30 to 40 couple might still be got in a day. Taking into consideration, however, the long railway journey, the hard work and heavy going I have never considered the place worth visiting of recent years."

Such a bag as this has never fallen to my lot, but I once had the luck to come across the birds in such numbers that though I

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was not on the ground until 3-30 I had to stop before 5 having run out of cartridges. On this occasion the bag consisted of 26 couple of snipe and 3½ couple of quail and the cartridges expended numbered 79. The ground was mud and water of only a few inches in depth and the walking was ideal, but the paddy was very long and we lost a few birds in it.

I have often been asked whether it is better to shoot at snipe directly they rise or to wait until the twistings ceased and the bird gets straight on the wing. Probably the best way to shoot is that which suits each individual best. I have seen equally good shots amongst both types of performers and do not think the preference can be given to either style. Mr. Cornish knocked his birds over so quickly that to the looker-on it appeared as if he must have spotted them before they rose. My father, on the contrary, was a slow shot and let them get well away before firing, yet as regards their second barrels, there was nothing to choose between them. Mr. Dods, who is probably the finest snipe shot in Eastern India at present, I believe lets his birds get well on the wing before shooting.

The ordinary call of the snipe is, as every one knows, a single note which has been described in many ways but may be syllablized as péch, pronounced sharply with a nasal twang. In the breeding season, however, the snipe makes a sound, called either drumming or bleating, which was for a long time a subject of keen discussion.

Dr. P. H. Bahr (in *loc. cit.*) has written a long and most interesting article on the manner in which this sound is produced and has conclusively proved that it is made by the tail feathers.

The following is an extract which he has kindly given me permission to take :—

"In the summer of 1904, in the Fens of Cambridgeshire, I began to observe the Snipes in the act of bleating through a strong prism binocular. I had read none of the literature on the subject, and so had no preconceived ideas. The observation I made then I have had ample opportunities of confirming.

"I find that ordinarily the bird flies up to a height of 60-100 feet above ground, in windy weather going higher, with its tail held

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in the ordinary position of flight, then turning, it spreads its tail out like a fan, *the two outer tail-feathers* being spread out well in front of the other twelve and held firmly there. Immediately the birds begin to descend the bleat is heard (making due allowance for the time it takes for sound to travel). While descending the bird makes tremulous motions with its wings from the radiocarpal joint. The descent is made from 30—40 feet and occupies 2—3 seconds, the bleat lasting the same time. The bird does not drop head foremost through space, but at an angle of from 45—60 with the horizon. The tail as a whole is not vibrated, but it is quite easy to see the two outer tail feathers with a strong glass vibrating to such an extent that their terminal portions become indistinguishable. Snipes begin to bleat in March, but if the weather is mild, in February, and continue to the end of May, though I heard one last year in Sutherland still bleating on June 25th.

"At the beginning of the breeding season they may be seen bleating in pairs; but later on when the hen is sitting the cock bird may be seen performing alone over the marsh where the nest is placed. Under favourable conditions many bleat together, circling round the same spot for hours. On April 12th of last year, I had the good fortune to hear no less than twelve birds bleating together a concert which they kept up all through the night. Every now and again, as if by common consent, there would be a lull and all the birds would settle, but directly one began again all the rest immediately joined in the chorus.

"Snipe bleat best in the early morning and in the evening, especially when the weather is dull and damp. It may be of interest to note that last spring I saw a specimen of the melanistic variety (Sabine's Snipe) bleating.

"Once having convinced myself that the two outer tail-feathers are invariably spread out beyond the others—a fact which is now obvious to me with the unaided eye—it seemed to me that the two outer tail-feathers must be the active agents in causing the bleat. I accordingly procured several tails of the Common Snipe, and taking the two outer tail-feathers pierced the shaft with a pin to which I firmly bound it with cotton and inserted the feathers into a cork at the end of a stick some six inches long. A hole is

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bored at the other end of the stick and a long string attached. This is whirled round the observer's head and a typical bleat is produced The second outer tail-feathers (sixth pair) produce a fainter sound, though this varies much in individual tails, the others make no sound at all.

"In order to ensure the success of the experiment it is necessary—(1) that the feathers be placed so that the narrow edge—the outer web—shall encounter the resistance of the air; (2) that the feather be firmly bound to the pin, so that it cannot turn on its support; (3) that the string be tied to one end of the stick, so that the long axis of the stick makes an angle with the direction of the string, if I may so put it, so that a vibratory motion is imparted to the stick as a whole, thus simulating the tremulous motion of the snipe's wings during the descent; (4) lastly, that the apparatus be moved at a uniform rate and not too fast.

"It is then found that after a period of silence the feathers begin to vibrate: first, the long-drawn-out note, which I may represent as "*Whu, Whu, UU,*" becomes gradually audible; it is then succeeded by a series of high and low notes "*Bah, Bah, Ah, Ah,*" resembling the bleat of a young goat, lasting 3-5 seconds, followed by a *pause of equal length.* This is repeated as long as the apparatus is revolving at a uniform rate. It is found that the individual tail-feathers, of which I collected a good number during the winter, vary considerably both in size, breadth and markings, and, as might be expected, the note produced varies according to their physical characteristics. Thus a long narrow feather produces a sound of far higher pitch than a broader one of the same length. This fact I have noted when comparing the sound made by the several birds when performing the nuptial evolutions over the breeding grounds. To ascertain which part of the feathers is essential in the production of the sound, I have cut off the narrow outer web without altering the bleat in any way; but if the barbs of the inner web be so disarranged that there is a break in their continuity, the web ceases to vibrate and no sound is produced. That the vibration of the inner web is the active causative agent may be seen by the following simple experiments. The feathers are attached to a cork with the outer web held away from

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the observer, so that the narrow outer web shall cleave to the resistance of the air. Thus affixed, they are held out of the window of a train or while riding a bicycle. As the resistance of the air is encountered, the inner web begins to vibrate, slowly at first, but, as the train gains speed, so rapidly that its outline is entirely lost and it becomes blur; a low humming sound is at first heard which soon reaches the typical pitch of the bleat. When the train has reached the speed of some 20 miles an hour, the whole feather will vibrate on the pin. If the feathers are at all loose on their pins, it is curious to observe how they will always turn round, so that the narrow outer edge encounters the resistance of the air. Furthermore, if the feathers be damped, they appear to act better, thus explaining, perhaps, why snipe are found to be liable to bleat in damp weather. I think this simple experiment readily explains away the "adverse cases" of Prof. Altum ('Ornithologisches Central-blatt,' October 1880), already mentioned.

"That the hens bleat as well as the cocks is now, I suppose, a well-known fact (cf. Von. Preen, '*Naumannia*,' 1856, pp. 426, 427, and Meves, Proc. Zool. Soc., 1859, p. 200). I have observed it on several occasions myself. In the summer of 1902, I found four newly hatched snipe in a patch inhabited by only a single pair; while lying concealed in the neighbourhood, I observed repeatedly *both* old birds drumming above me. From the similarity of structure of the tail-feathers in both sexes—a fact which I have ascertained by dissection—one would infer that both sexes drummed. I cannot, however, agree with Meves that "as the feathers of the hen are generally less than those of the cock-bird, the noise also made by them is not so deep as in the other case." (*Op. cit.*, p. 200). I can find no difference either in the length of the feathers or in the intensity of the sound produced by the feathers of either sex. I have received a letter from Mr. S. A. Buturlin in which he says that in 1905 on the Kolyma Delta he frequently observed both sexes of the eastern representative of our species (*Gallinago raddei*) drumming.

"Since the two outer feathers are extended beyond the other twelve during the descent, as I have described, I sought to find by dissection a mechanism by which this might be produced. On

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examining the tail of a freshly-killed bird it is quite easy, by spreading out the tail, to make it assume the arrangement shown. I was unable, however, to find any special muscle peculiar to the species controlling in outer two tail-feathers. The muscle pubo-coccygeus ext. is inserted into the base of the shaft of the outer two tail-feathers, and is quite capable of perfoming this function. This muscle is to be found equally well developed in the other species of Plovers and Waders which I examined. The nomenclature of the muscular system of the tail is that of Gadow in Bronn's "Thier-Reich."

"I have tried the same experiments as I have just described with the primaries from the wing of the snipe, and was not able to produce any more sound with them than with others taken from other kinds of Waders, Pigeons, etc. There seems to have existed an opinion at one time that the bird produces two sounds, one with the wings and the other with the tail, the former being known as humming or drumming and the latter whirring or bleating produced while the bird is on the ground (cf. "Zoologist," 1881, p. 212, and 1846, p. 1501). I cannot say that this agrees with my own experiences."

To the above Dr. Bahr adds in a letter to me: "An old friend of mine, a very keen naturalist and observer, Master Leherer Praht of Lilienthat, Germany, has been a disbeliever in the tail theory from observations extending over 40 years. He has now had the following experience which has converted him to my way of thinking.

"He had winged a snipe which ran before him and in so doing spread its tail with the thin outer feathers stiffened in front of the others and, as a strong wind was blowing, the feathers began to vibrate and the bird actually "*bleated*" whilst lying on the ground."

On the strength of the above article by Dr. Bahr, Mr. W. S. Paget-Tomlinson made some interesting experiments which fully confirmed what Dr. Bahr had already written. These experiments Mr. Paget-Tomlinson described in the *Times* of the 21st August 1909 and 26th December 1908 as follows:—

"However, the proof is best furnished by a simple experiment

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devised by Dr. Bahr. Pierce the shaft of each outer tail-feather with a pin, to which it must be firmly bound. Insert the pins with their attached feathers on each side of a small cork, taking care that the outer web (narrow edge) of each feathers faces the same way. Fasten the cork to the end of a short stick (six inches long). Through a hole in the other end of the stick pass a long string. When the apparatus is whirled round the observer's head, care being taken that the outer web of the feathers meets the resistance of the air (as occurs with the outer tail-feathers of the snipe when it makes its descent) a long drawn-out note is first produced, which gradually rises in pitch, until the typical bleating sound is heard. The same effect can be obtained by holding the cork and its feathers outside a railway carriage window, when the train gets up speed, but only when the outer or narrow web of the feathers cleaves the air. This outer web may be actually removed from the feather without altering the bleating sound, but if the broad inner web be seriously damaged, no sound is produced. The second outer tail-feathers produce a fainter sound; the remaining ones none at all."

"Mr. Lee Warner, of Walsingham Abbey, suggested to me that it would be interesting to try the experiment of shooting an arrow with the tail-feathers of the bird attached, so as to imitate nature as far as possible. I have recently tried this, with the most perfect success. Employing an ordinary ladies' arrow as used in archery I slipped a small perforated cork down the shaft, as far as the feathers of the arrow. Having tied the cork securely, I fixed the pins, each carrying an outer tail feather, one on each side of the cork, at right angles to the shaft of the arrow, taking care that the outer or narrow web of the feathers faced towards so as to cut the air when the arrow was shot. It was, of course, also necessary to place the feathers in the same plane as the string, so that they would not be damaged as the arrow left the bow.

I shot it almost vertically to a height of about 60 or 70 yards. The velocity of the arrow in leaving the bow was probably too great to produce the normal "drumming" sound, though it somewhat resembled it; when the arrow turned to descend nothing could at first be heard, but when it gained speed, and was about 30 yards

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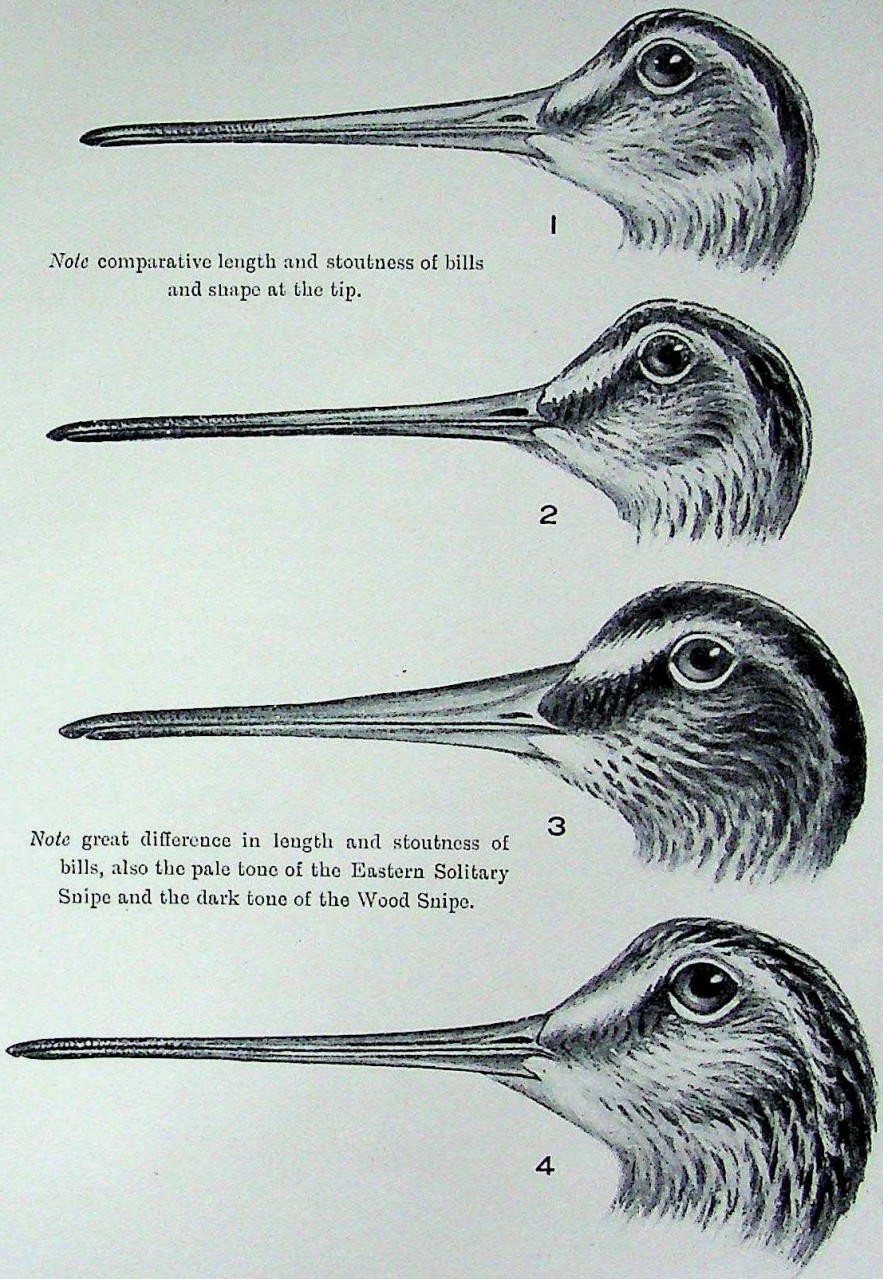

Note comparative length and stoutness of bills and shape at the tip.

Note great difference in length and stoutness of bills, also the pale tone of the Eastern Solitary Snipe and the dark tone of the Wood Snipe.

HEADS OF SNIPE FOR COMPARISON OF BILLS.

1. PINTAIL SNIPE (*Gallinago stenura*).
2. COMMON OR FANTAIL SNIPE (*Gallinago cœlestis*).
3. WOOD SNIPE (*Gallinago nemoricola*).
4. EASTERN SOLITARY SNIPE (*Gallinago solitaria*).

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from the ground, the most perfect imitation of the "drumming" was produced, continuing till the arrow pierced the sod."

Before leaving the topic of drumming or bleating, part of a very interesting article by Mr. Boyes may be quoted from the "Field" of July 1898. He writes: "I am not aware whether any naturalist has stated that the hen bird drums as well as the male, but I think I can settle this point in the affirmative, for one day I visited a very small strip of bog, and almost immediately rose the cock bird which commenced to drum alone and around me in a short time. I flushed the hen off her nest of three eggs and as she left it she dropped the fourth egg, which broke in its fall and the bird, continuing its flight, struck itself against some posts and rails and fell stunned to the ground, but soon recovered and flew away. I marked it, and afterwards went and put it up. All this time the male was drumming overhead and no other snipes were in the neighbourhood. The female now joined in the drumming and the two were drumming for some time, and then they both alighted on the tops of posts, and allowed me to walk quite near them nodding their heads at me all the while."

The reader will note the curious fact of the snipe sitting on the posts, but, though here in India the idea of the snipe perching seems curiously improbable, it is a well known fact that in their breeding range and when breeding they frequently do so.

The food of the Fantail Snipe consists of worms of all or any kind, insects, more especially water-insects, tiny shellfish, land shells, larvæ of dragon flies, caddis flies, etc. Digestion in snipes seems to be exceedingly rapid and often, even in very fat birds, the stomach will be found to contain only liquid, a fact which very probably gave rise to the belief, at one time so common, that snipe lived on microscopic insects and some nutriment they derived from suction of the mud itself.

All snipes possess more or less sensitive beaks furnished with nerves and also with muscles, which enable them to open the terminal halves of their bills when inserted in mud. Both nerves and muscles are more highly developed in the Fantail than in any other snipe (*G. major?*) and accordingly, as we should expect,

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this species seeks its food more exclusively in mud and water than does any other.

On an examination of snipe shot very early in the morning or late in the evening, that is to say when feeding, I have often found their stomachs full of a tiny white worm which seems to be found in and about the roots of rice. I have shot snipe with these worms actually in their bills or gullets as well as in their stomachs, but never when the birds were shot late in the day before the sun had sunk low. To obtain these worms the bird has to bore deep into the mud and must often have to put its whole head under water before it can reach them, as I have shot snipe, containing this article of diet, feeding in water some inches deep.

The snipe is not a bird one would have expected to thrive in captivity but it has more than once been tamed. A most interesting account of a tame Fantail Snipe reared by hand appeared in "Nature" and again in the "Avicultural Magazine." This bird was so tame that it took worms from the hand of its owner and was sufficiently confiding to allow excellent photographs to be taken of it.

There is very little on record about the breeding of the Common Snipe within Indian limits although it must breed throughout the Himalayas at suitable elevations.

Brooks heard it drumming over a swamp in Kashmir where it doubtless had its nest, and Hume records that "numerous eggs have been collected by native collectors." "The nests found in Kashmir were described as cup-shaped hollows in soft, mossy, spongy turf, surrounded or overhung by rushes and grass, and sparingly lined with fine grass, and in one case with the needle-like leaves of a horse-tail (*Equisetum*)."

"The birds do not apparently commence laying in Kashmir until May, and much incubated eggs have been found late in June."

Wilson, Rattray, Buchanan, Ward and others have since taken its eggs in Kashmir.

The first-named records that he "came across about six couples of these birds on the Sambul Marsh. We found several of the nests,

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but two only contained eggs. The nests, placed in the centre of a clump of thick grass or bracken, were shallow cups of dried coarse grass without any lining of any kind. We put the bird off the nest on two occasions. The first nest contained four beautifully fresh eggs and the second two. One of these eggs was fresh and the other broken and badly addled! Though the snipe never left the marsh during our search, we heard nothing of the drumming noise, but on several occasions noticed a bird hovering over its nest before settling."

I have two clutches of eggs of the Fantail Snipe which were taken in the Santhal Parganas. My general bird *factotum* skinner, egg collector, etc., in this district was a Mahomedan, who had lived all his life in the district and was more Santhal than Mahomedan in his ways and, like most Santhals, was a keen field naturalist. Shooting snipe one day with this man, he told me that a few bred every year in the ravines between the hills adjoining the Suri Road. I paid little attention to his story and thought that he was referring only to the Painted Snipe, but that same year he brought me a clutch of four eggs which were plainly snipe's eggs, and later on found another nest which I visited, taking the eggs with my own hand and shooting the bird as it left the nest.

Both these nests were placed at the foot of thinly-foliaged bushes standing in tiny swamps between low hills. The bushes themselves were so bare that they hardly screened the nest, but there were a good many tufts of grass and these had to be pushed on one side before the nest was visible. This, the nest, was composed entirely of a fine curly brown grass which formed quite a soft bed for the eggs to lie on. It measured only about 4" across and the centre of the depression was possibly an inch deep. The one I saw myself lay in a small hollow, which was probably made in the first place by the foot of some hoofed animal.

Blanford, who, however, makes no distinction between *cœlestis* and *raddei*, thus defines the breeding range of the Fantail Snipe:—"The Common Snipe breeds throughout the greater part of Europe, Central and Northern Asia, but chiefly between latitudes 50 and 70 North."

The eggs of the snipe are normally always four in number and

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are pyriform in shape, but less markedly so in some cases than in others.

The ground colour varies from a pale grey-green, grey-stone colour, or yellowish-stone colour to a comparatively dark olive-grey or olive-brown, in some cases the brown being dominant and appearing to be almost a pure though pale vandyke brown.

The markings consist of large irregular blotches, spots and dots of rich brown, often almost black and rarely with a purple tint. Secondary to these are similar markings of pale grey, lavender or purplish brown. These are scattered to some extent all over the surface, but, as a rule, they form a broad ring or cup at the larger end where they are almost invariably more numerous than elsewhere. In a few eggs a twisted line of deep brown may be found at the larger end, but this is exceptional.

In some eggs the markings are much elongated and are so disposed as to give the idea of having been laid on whilst the egg was being twisted, the trend of the blotches being distinctly spiral.

The texture of the shell is smooth and close and the surface fairly hard, in some cases with a decided gloss.

They are very large for the size of the bird, and Seebohm gives the measurements as between 1·5″ and 1·65″ in length and 1·05″ to 1·25″ in breadth. Oates gives the greatest length and breadth as 1·72″ and 1·2″ respectively and Dresser the average length as 1·61″.

In the southern part of their usual breeding range, the Common Snipe begins to breed in early April and throughout May, but in the more northern latitudes it does not commence to lay until June and eggs have been taken well on into July. In the Himalayas I do not think it breeds before May, and I have eggs taken in June.

The three plates are excellent, but it is difficult on a half tone plate to shew the differences between pure white and pale rufescent and it is probably this reason which accounts for both wings and tails appearing to have more white on them than is generally the case in all the species depicted.

In Plate A the difference between the terminal portions of the bills of *Gallinago stenura* and *G. cœlestis* is not quite pronounced enough and the heads of both birds appear to be a trifle too large.

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The difference also in tone and depth of colouring between the heads of *G. solitaria* and *G. nemoricola* does not strike one so forcibly in the plate as it does in real life, partly doubtless due to the fact that *solitaria* is more grey and less rufescent than *nemoricola*, a point which we can hardly expect to see emphasized in a black and white plate.

Turning to Plate B, the same remarks as to tone and depth of colouration apply to the wings of *solitaria* and *nemoricola* as to the heads in Plate A.

It is necessary also to point out that the wing of *G. cœlestis* is that of a rather darkly, heavily barred bird. The median wing coverts are *generally* pure white in this species and do not show the heavy markings at the bases which we see in these drawings. The axillaries also (these are the four long feathers at the base of the drawings) vary, as I have explained above, from pure white in typical *G. c. raddie* to others which are even more heavily barred than those in the plate.

As regards Plate C, all I need remark is that we must remember when examining it that some of the colouration which appears in this to be white is really a faint rufous. Even allowing for this, however, both the Fantail and Pintail more often than not have tails a good deal less marked with white than those shewn here as examples of those birds.

GALLINAGO CŒLESTIS RADDEI (Buturlin).

Radde's Snipe.

Scolopax gallinago raddei.—Buturlin "Waders of the Russian Empire," Part I, p. 56 (1902).

Description.—"Differs from the western form of the Common Snipe in having the pale longitudinal stripes over the upper parts of the body conspicuously broader 2 to 4 mm. wide, the median pale stripe on the crown wider, the dark parts of the feathers of the mantle more freckled with rufous, the chest less spotted with brown, the wing lining and axillaries less conspicuously barred with greyish brown, the axillaries being often quite white."

The above description was obtained for me by Mr. H. E. Dresser, and is translated from the original Russian of Buturlin.

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The breeding range of this snipe is given by Buturlin as follows:—

"Breeds in Eastern Siberia, east to Kamaskatka, and even the Commander Isles, and west to the Boganida Taimyr and Krasnoyarste."

Theoretically, therefore, this snipe should migrate in winter to the whole of Southern China and should visit Burmah and Eastern India in considerable numbers. As a matter of fact, however, typical specimens are not common, even in the east of India, though on the other hand, it may be found occasionally as far west as Bombay. Of the series of Fantail Snipe in the Asiatic Museum, there are but three specimens which can, without doubt, be allotted to this subspecies, and of these three one—strange to say—comes from Abyssinia. In Eastern Bengal, Assam and Burmah we shall find a very large proportion of birds more or less approach this race in the colouration of their axillaries and underwing coverts and to a less extent also in that of their upper plumage, but really typical specimens will be few and far between.

My own experience, gained from a close examination of my own bags and those of other sportsmen whenever possible, has been productive of some half dozen specimens one could really call typical. In some of these the axillaries were entirely pure white and the barring of the lower wing coverts absent except on the terminal thirds of the greater coverts and the shoulder of the wing.

I have a clutch of four eggs of this snipe in my collection, given me by Mr. H. E. Dresser, who secured them from Dr. Buturlin. As might be expected, they are not distinguishable from those of the Common Snipe, though they are duller coloured than most eggs of that bird.

The ground colour is dull olive—stone colour, in one egg—rather more brown than in the other three, and the markings consist of large and small blotches and spots of different shades of vandyke brown, all dark and many almost black. Underlying there are others of purple grey and washed-out brown. At the larger end, where the blotches are very numerous, they run into and overlap one another; elsewhere they are smaller and sparsely scattered. In one egg there is a long twisted line of dark brown, about 1½″ in

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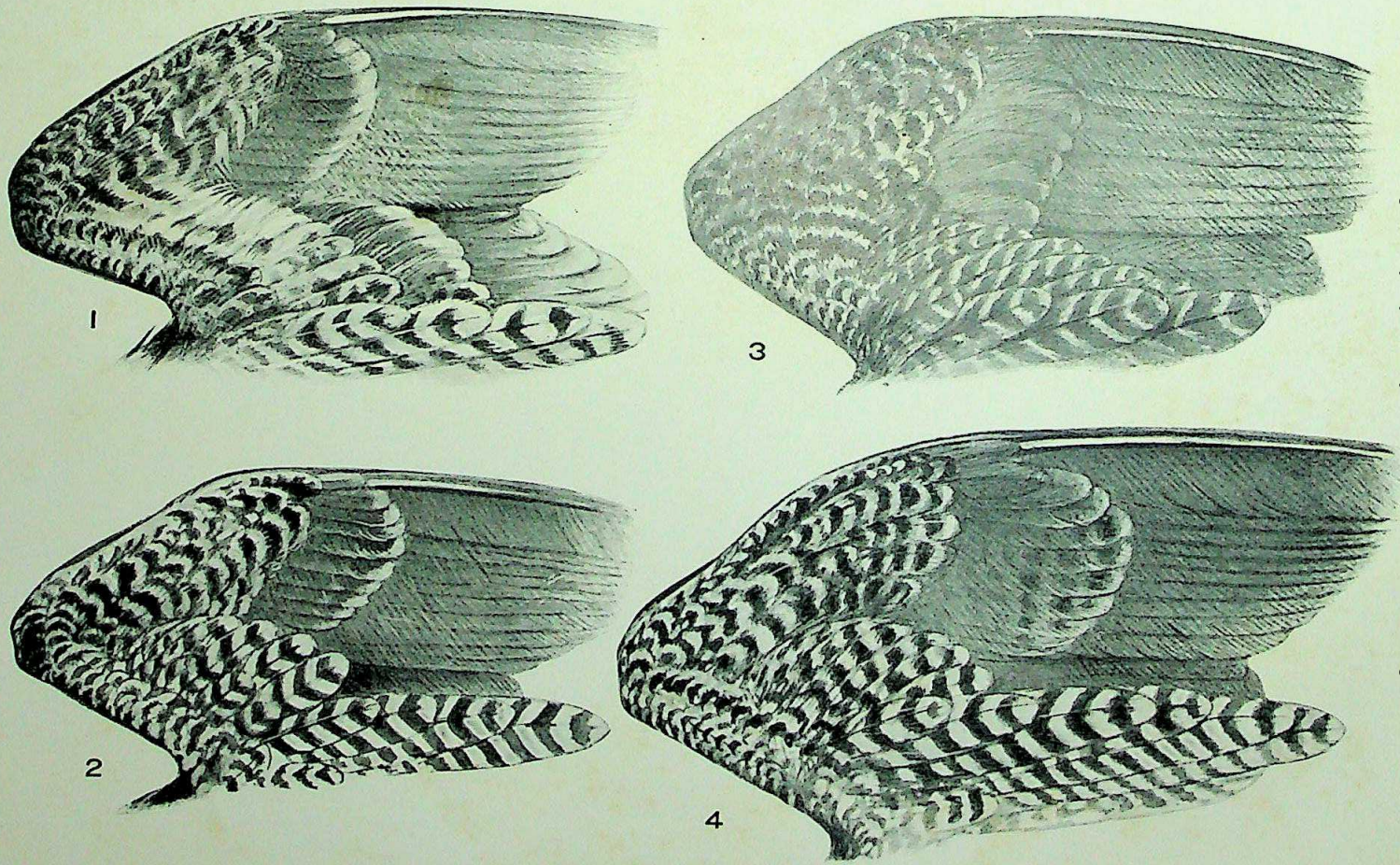

UNDER WINGS OF SNIPE.

1. FANTAIL SNIPE } *Note* regular barring on the Pintail and whiter median coverts on the Fantail.
2. PINTAIL SNIPE }

3. WOOD SNIPE ... ... } *Note* difference in depth of colouration and comparative length of inner primaries.
4. EASTERN SOLITARY SNIPE }

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length and very narrow; this forms a circle at the extremity of the larger end.

They are of the usual pyriform shape, and do not differ in texture from the eggs of *Gallinago coelestis*.

They measure 1·56″ × 1·11″, 1·56″ × 1·13″, 1·58″ × 1·15″, and 1·56″ × 1·09″. They were taken at Pokkodski, Kolyma on the 22nd June 1905.

GALLINAGO MAJOR.

The Great Snipe.

Scolopax major.—Gmelin, Syst. Nat., i, p. 661; Seebohm, Charadindon, p. 482.

Gallinago major.—Sharp, Cat. B. M., xxiv, p. 626; *id*, Handbook, iii, p. 201; Oates, Cat. Eggs, B. M., ii, p. 60; Oates, Game-Birds, ii, p. 467; C. Donovan, J. B. N. H. S. Journal, xii, p. 782. Finn, Indian Waders, p. 152.

Description.—Adult male.—" General colour above black, mottled with sandy buff, with which the feathers are fringed and barred in an irregular and wavy manner, so as to leave large patches of black; the scapulars with whiter and broader edges, so as to form a double line down the back; lower back, rump and upper tail coverts sandy buff barred with dusky brown, the end of the tail coverts white; wing coverts blackish brown, the marginal series with ashy fringes, the remainder with conspicuous white tips, before which is a black subterminal bar, the inner greater coverts also barred with sandy rufous; bastard wing and primary-coverts blackish, tipped with white; quills dark brown, the secondaries tipped with white, the innermost being barred with sandy rufous and resembling the back; tail feathers bright rufous, with black bases and black bars on the terminal half of the feather, scarcely visible near the tips; the white tip to the feathers gradually increasing in extent until the four outer ones on each side are entirely white except for a little black near the base; centre of crown whitish, bordered on each side by a broad band of black, slightly freckled with rufous, and followed by a broad superciliary streak, ashy whitish in front and fulvescent behind; a dusky streak from the base of the bill to the eye; sides of face whitish, with numerous tiny blackish spots,

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and a dark patch below the ear-coverts; the hind neck and sides of neck sandy buff, streaked with black, chin, breast and abdomen white; the lower throat, fore neck and breast pale sandy buff, with central spots of black on the feathers; the sides of the breast and flanks regularly barred with black; the under tail coverts sandy buff, tinged with rufous, and having more or less complete bars of black; under wing coverts and axillaries white, barred with black, the latter very distinctly banded; lower primary coverts and quills below uniform ashy brown" (Sharpe).

"Bill brown; feet light slate colour; iris very dark" (Ayres).

"Bill dull flesh coloured at the base darkening to black at the end; legs dull flesh colour, the joints plumbeous, iris dark brown. Culmen 2·4, wing 5·5, tail 2·5, tarsus 1·4" (Dresser).

"Culmen 2·45, wing 5·55, tail 2, tarsus 1·35" (Sharpe).

Adult female.—Similar to the male.

"Culmen 2·5, wing 5·3, tail 2, tarsus 1·5" (Sharpe).

From the above it will be seen that the female, as far as is shewn by the few sexed females in the British Museum collection, is a somewhat smaller bird with longer bill and legs. The wing in a few females sent to me for examination have average 5·50.

Winter plumage.—"More sandy-buff than in summer, the buff edges to the feather of the upper surface broader and more conspicuous, the blackish markings on the fore neck larger and coarser, and either circular or horse-shoe shaped" (Sharpe).

Young.—The young have less white about them than the adult, the white outer tail feathers being a good deal barred, in addition to this the general tone is much more rufescent and the lower surface darker.

Nestling.—Ashy fulvous, the crown and centre of the back more rufous, sides of the face and a broad supercilium white, coronal and orbital lines black, and other lines of black about the face; wings rufescent fulvous, sides of back and a patch on each flank black. Under surface bright fulvescent, a dark patch on the lower throat and the centre of the abdomen nearly white.

Distribution.—Breeds in Northern Europe and in Western Siberia, as far North as 69° N. Lat., as far East as the Valley of the Yenesi and winters in Southern Europe and Northern Africa,

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also extending throughout Western Asia, through Asia Minor to Persia.

The only record* of its occurrence in India is that in the B. N. H. Society's Journal, Vol. xii, p. 782, by Capt. Donovan.

This gentleman recorded that on the 5th Sept. 1899 he shot a bird near Madras weighing over 8 oz. and with a wing of about 6″ in length which he sent to the Madras Museum for identification. The Museum authorities pronounced the bird to be *Gallinago nemoricola*, and then, as it was far advanced in putrefaction, threw it away.

Fortunately before sending the bird away Capt. Donovan carefully examined it and made copious notes. The main features noticed by him in his examination of the bird were (1) its outer tail feathers were soft, (2) not attenuated, (3) were white with only two or three bars near their bases on the outer webs, and (4) in addition to this the snipe had conspicuous white tips to the wing coverts.

These points are ample for the purposes of identification and there cannot be the least doubt but that the bird shot by Captain Donovan was a specimen of the *Double* or *Great Snipe (Gallinago major)*.

Moreover, there is no reason why the Great Snipe should not sometimes visit India though it is curious that it should be first recorded from the extreme S. E. It has been obtained at Fao in Southern Persia by Cumming and in its Western Range it migrates very much further South than the latitude of this place, indeed it has been obtained as far South in Africa as Cape Colony itself. Here in India we should expect to meet with it occasionally in any part of Baluchistan, Sind or Northern Bombay and less often in other parts of Western and Southern India.

The Great Snipe seems to be even more exclusively nocturnal in its habits than the other members of the genus, feeding almost entirely by night and not moving, unless forced to do so, after the sun has risen at all high.

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* Since this was written our Society has received a specimen of what proves to be undoubtedly *Gallinago major* from Capt. A. Boxwell, 119th Infantry, Bangalore, and this bird was shot on October 1910, near Bangalore. A note on the subject will appear in the next Journal. —EDS.

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It is found in much the same sort of country and ground as *Gallinago cœlestis* but is perhaps rather inclined to lie up in thicker cover than does the latter bird. In their diet *cœlestis* and *major* resemble one another very closely, and an examination of the bills of these two birds will show that this is what we should expect as in structure and sensitiveness they are much the same.

Dresser says that their food consists of worms, small slugs, insects and larvæ.

The flight of the Great Snipe is very inferior to that of the Fantail or Pintail Snipe and more nearly approaches that of the Wood Snipe, though it does not appear to indulge in the curious side movements and sudden final plunge into cover so characteristic of that bird, still it is comparatively slow and heavy on the wing and offers an easy shot.

I can find no record of any day's shooting devoted entirely to this snipe, and when shot they seem invariably to form merely a part of the bag on days when the Common Snipe has been the object of pursuit.

Its breeding season varies according to latitude, in the most Southern portion of its breeding range its eggs may be taken as early as the last week in April, and throughout May into early June, but in the more Northern latitudes it will not be found to lay until at least a month later and few, if any, eggs will be taken before June.

It is very doubtful if the Great Snipe "drums" in the true sense of the word. Dr. Bahr, as a result of his experiments with the tail of this snipe, writes "the feathers produce *no* sound," a result which he obtained only from experiments with the tail-feathers of the Great Snipe and the Jack Snipe.

They do however produce a sound during the breeding season, which has not yet been explained and may therefore be either vocal or mechanical.

Professor Collett in Dresser's Birds of Europe (Vol. vii, p. 635) thus describes its breeding habits: "It has a so-called *Leg* or *Spel* like some of the Grouse tribe, a sort of meeting place where they collect to drum and often to engage in combat for the possession of the females. . . . It does not indulge in ærial evolutions but

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remains on the ground. . . . . The male bird utters a soft, almost warbling note, which is accompanied by a peculiar snapping sound caused by striking the mandibles together several times in quick succession. If a person approaches one of their humming places he can hear at some distance the low note: 'bip, bip, bipbip, bip-biperere, biperere;' and when within 100 paces, if the night is still, he begins to hear other peculiar sounds. . . . . Whilst producing these notes the bird is in ecstacy and raises and spreads his tail like a fan, the outer tail-feathers showing in the half darkness like two white patches."

Dr. Bahr conjectures that these sounds are vocal, but he has shown (vide *G. cœlestis*) that the drumming of the Common Snipe *can* be produced, under certain circumstances, on the ground, and it therefore seems possible that the Great Snipe also "drums" by some mechanical vibration of his tail-feathers.

Seebohm says that this snipe "makes its nest in long grass, but more often in the middle of a hillock of sedge or grasses. A small quantity of moss or dead grass is placed as a lining to the depression, where its four eggs are laid."

"The eggs of the Great Snipe are very handsome, and vary in ground colour from pale greyish buff (sometimes with the faintest possible green tinge) to pale brownish buff, and are spotted and blotched with rich dark brown and paler brown and with underlying markings of purplish-brown and grey. Most of the blotches are distributed round the largest part of the egg, often in an oblique direction, and many of them are confluent. Some eggs have the large end covered with a network of streaks, but more often only a few lines are seen. The underlying markings are large, numerous and very conspicuous.

I have an extremely handsome clutch of three eggs of *G. major* in my collection taken in Denmark on the 14th June 1874. The ground colour is a bright pinkish stone colour blotched all over the surface with very large blotches of vandyke brown, some bright and clear, others almost black; the sub-surface marks are of the same description and nearly as large but one of a lavender and purple grey colour and rather less numerous.

When newly taken, these eggs must have been extraordinarily

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glossy as now, after a lapse of 36 years, they are still more glossy than most snipes' eggs. "These eggs measure between 1·80" and 1·84" in length and 1·24" and 1·28" in breadth. They are of the usual snipe and plover pig top character in shape, but the texture seems harder and closer than in most snipes' eggs.

This curious pink ground colour agrees well with Oates' description of the eggs of *G. solitaria*, a colour, which he says, renders the eggs of that bird easily distinguishable from all other snipes' eggs.

The ordinary full clutch consists, of course, of four eggs as with all other true snipes.

Seebohm gives the size as varying between 1·7" and 1·9" in length and between 1·22" and 1·3" in breadth, and Dresser gives the average as 1·75" × 1·24" and in "Eggs of the Birds of Europe," p. 688, gives the variation in length as between 1·73" and 1·83" and in breadth as between 1·21" and 1·28". Jourdain gives the measurements as bigger than this and the average of 31 as being 1·79" × 1·33".

GALLINAGO STENURA.

The Pintail Snipe.

Scolopax stenura.—Kuhl. Seebohm, charadriidæ, p. 477; *id* B. Jap. Empire, p. 345.

Scolopax horsfieldii.—Gray, Zool. Misc., p. 2; *id* et Hardw. Ind. Zool., ii, Pt. 54.

Gallinago horsfieldi.—Hume. Str. F., iii, p. 182.

Gallinago stenura.—Jerd. B. of In., iii, p. 674; God. Ans. J. A. S. Beng., xxxix, p. 273; Blanford, *ibid*, xlx, p. 270; Marshal, Str. F., i, p. 428; Hume, *ibid*, p. 423; Hume, *ibid*, ii, p. 294; Parker, *ibid*, p. 335; Ball, *ibid*, p. 431; Blyth and Wald. B. of Burmah, p. 156; Armstrong, Str. F., iv, p. 340; Hume, *ibid*, v, p. 46; Butler, *ibid*, p. 212; Legge, B. of Cey., p. 816; Oates, B. B. B., ii, p. 383; Sharpe, Cat. B. M., xxiv, p. 619; Blan. Avi. of B. I., iv, p. 289; Finn, In. Waders, p. 148; Sharp, Hand List, B. M., i, p. 165; Oates' Indian Game Birds, ii, p. 469; *id.* Cat. Eggs B. M., ii, p. 356; Stuart Baker, J. B., N. H. S., xii, p. 500; Butler, *ibid*, xiii, p. 149; Wall, *ibid*, xv, p. 722.

Gallinago sthenura.—Le Mess., Str. F., iii, p. 380; Hume and

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Dav., *ibid*, vi, p. 459; Hume, *ibid*, vii, p. 39; Dav. and Wen, *ibid*, p. 88; Ball, *ibid*, p. 228; Cripps, *ibid*, p. 301; Hume, *ibid*, viii, p. 69; *id*, *ibid*, p. 112; Bingham, *ibid*, p. 196; Scully, *ibid*, p. 354; Butler, Cat. B. of Scind, p. 61; *id*, Cat. B. S. Bom. Pres., p. 75; Vidal, Str. F., ix, p. 83; Bingham, *ibid*, p. 196; Reid, *ibid*, x, p. 68; David, *ibid*, p. 320; Davis, *ibid*, p. 413; Murray, Vert. Faun. Scind., p. 239; Hume, Str. Feath., xi, p. 319

Pintail Snipe.—W. Gaye., J., B. N. H. S., vi., p. 418; St. J. Richardson, *ibid*, p. 488.

Vernacular Names.—No natives appear to recognise the difference between the Pintail and Fantail Snipes and the vernacular names given to the latter apply equally to both.

Description, Adult Male.—The Pintail Snipe differs from the Fantail in colouration in having the whole of axillaries and under wing coverts regularly barred throughout with black, or brown, and white, the former colour being predominant. The average bird is also duller and darker in its colouration, this more so on the lower than the upper parts. The bill is proportionately shorter and stouter and the tail consists, normally, of 26 or 28 feathers, the external 8 or 9 on each side being very stiff and narrow, the outermost only about 1″ in width.

The outer web of the first primary is, in all text books, said to be brown, but this is not quite correct, as in a large series one finds many specimens with very pale outer webs, though these may never be quite white.

"Length 9·75″ to 10·9″; expanse 15·5 to 17·4; wing 4·95 to 5·42; tail from vent 2·0 to 2·57; tarsus 1·19 to 1·27; bill from gape 2·12 to 2·5; bill at front 2·2 to 2·6; weight 3·3 oz. to 4·75 oz., average 3·91" (Hume).

"The legs and feet are greenish or greenish leaden, but especially late in the spring these parts exhibit, in some birds, a distinct olive yellow tinge; the irides are deep brown; the bill generally has the gape, the extreme base and margins of the upper mandible greenish or olive, but sometimes some or all of them are unicolorous with the rest of the basal four-sevenths of the upper mandible which are usually pale hoary brown; on the other hand even these at times show a greenish tinge; the terminal three-sevenths of the

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bill are deep brown, blackish hoary towards the tip, and paling towards the opposite direction." (Hume).

All I can add to these notes is that I have often seen the Pintail with legs and feet of an olive-yellow colour even in September and October, and have had specimens sent me in these months whose legs when fresh? were described as yellow, and it is probable that old birds have their legs more decidedly yellow than the young.

Description, Adult Female.—The female only differs from the male in being somewhat larger.

Hume gives the dimensions of the female as "length 10·1 to 11·17; expanse 16·1 to 18·25; wing 5·0 to 5·58; tail from vent 2·0 to 2·67; tarsus 1·2 to 1·35; bill from gape 2·38 to 2·62; bill at front 2·45 to 2·7; weight 3·75 to 5·1 oz., average 4·2 oz."

The average measurements of those I have measured have been *males*, wing 5·11", bill 2·35"; *females*, wing 5·25", bill 2·41". Sharpe gives the measurements as *male*, wing 4·9", bill 2·3"; *female*, wing 5·1", bill 2·45".

The Pintail Snipe is extremely variable in its plumage, and I quote Hume's remarks, anent this variation, in full. He says: "I have specimens now before me with the entire lower breast, abdomen and vent pure white and unmarked. I have others with the whole of these parts barred, almost as strongly and as regularly as in *nemoricula*. There are some in which the front of the throat and upper breast are fawn-coloured blurred with numerous illdefined spots and streaks of dark brown, and others in which the upper breast is strongly and distinctly, though irregularly *barred* . . . . The upper surfaces differ widely—some are altogether brighter, the black more intense, the markings on the scapulars are more intense rusty, their pale margins a brighter and richer buff."

The variations in the under parts are certainly individual, but on the upper parts the brightness and depth of colouring depend, as is so many birds, on the newness of the feathers. As is well known black and red are the colours, next to green which *weather* most and consequently shew most variation in the colouration of new and old feathers.

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Just as there are pale and melanistic forms of the Fantail Snipe so are there of the Pintail.

Of the latter type there is, however, but one at present on record, that is the one recorded by Hume in Game-Birds. Of this he writes: "Before the mutiny I had a specimen procured near Dacca which was everywhere blackish dusky, darker than either of the only two Sabine's Snipe I ever saw, but very similar to these; but alike in these and in all the albinoid specimens I have seen, the wing lining and axillaries differed but little from the normal type, and had not participated, at any rate to the same extent, in the general change or loss of colour."

The pale, or albinoid specimens, as Hume terms them, are almost equally common in both species. Hume writes: "I have a fine example now before me, procured by my friend Mr. J. C. Parkin near Calcutta. The lower surface does not much differ from the normal type, except that the markings on the breast and flanks are pale brownish grey, but the entire upper surface is a mixture of pale cream colour and pale brownish grey. I have seen at least half a dozen similar creamy coloured birds in the course of the last thirty years. I also once shot one that was snow-white everywhere with only faint traces of grey markings."

The Bombay Natural History Society possesses three pale specimens of *G. stenura* and there is a fourth in the Indian Museum, Calcutta, all of which are very similar in their colouration to the pale specimens of *G. coelestis* already described. The Bombay birds, curiously enough, both have a few feathers of the scapulars and tail normally, or partly normally coloured, a fact I have also noticed regarding some of the pale specimens of the Fantail. The Indian Museum bird has a few normally coloured feathers on the upper back and appears to be moulting into normal plumage as these feathers are all new.

Another specimen in the Indian Museum is very beautiful, the ground is a pure white, but the markings are of a curious vinous grey pale everywhere with a few deeper markings, shewing on the scapulars.

In describing *Gallinago stenura* it has already been said that this snipe normally has 26 or 28 tail-feathers of which the lateral 8 or

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9 pairs are attenuated; these outer feathers, however, vary considerably in number, and it is not unusual to find as few as 6 pairs only of these, the central feathers, 10 in number, never varying.

It is a curious coincidence, also, that in the majority of cases in which this small number of feathers is found, the birds seem considerably larger than the average. My attention to this curious combination, *i. e.*, extraordinary size with so few tail feathers, was first attracted by some letters to the *Indian Field* written by Mr. W. Val Weston, under the *nom-de-plume* of "Silvertoun." On the 29th October he wrote giving the measurement of one of these snipes: "beak $2\frac{5}{8}$, wing $5\frac{1}{8}$, weight $5\frac{1}{2}$ oz;" on the 11th he sent the measurements of two more, "bill at front $2\frac{1}{2}$ and $2\frac{3}{4}$, wing $5\frac{3}{8}$ and $5\frac{1}{2}$," and on the 30th of November he recorded a fourth but did not give measurements of bill and wing.

Mr. Val Weston has kindly added further information in regard to these big Pintails in letters. He first sent me a specimen (now in the Society's Museum) which measured when dry, wing 5·35, bill at gape 2·63, and then on the 2nd January 1910, wrote me as follows:—"Yesterday I shot two more of these big snipes and also an ordinary Pintail and a lot of Fantails. The difference between the big and small forms is most marked and they are easily distinguished when in the air. The measurements of the two are, wing, each $5\frac{1}{2}$, bill at front each $2\frac{1}{2}$, weight both considerably over 5 ozs. Tail feathers 22 and 23. The big Pintail does not come in at the same time as the ordinary small birds. By the 1st September the country is full of Pintail Snipe, but amongst them never one of these big birds. By October the Pintails have moved on and their place is taken by Fantails, and it is then that we begin to look for the big birds. *They come with the Fantails and not with the Pintails.* By the middle or end of February the Pintails begin to come back, and in March there are three Pintails to one Fantail, but I have never shot one of these snipes later than the 19th February, that is to say, never during the northward migration of the Pintails."

From the inquiries I have made from sportsmen there seems to be a very general idea that there is a form of Pintail which differs from the ordinary birds in being much larger, but an examination of the skins sent to prove this show that these birds

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are nothing but very large specimens of the ordinary Pintail. I can see no single point about them beyond their unusual size by which one can discriminate them, though, as already observed, these very large birds seldom, if ever, have more than 22 feathers in their tails. This difference in size is perhaps even more noticeable in bulk than it is in wing and bill measurements. It must also be noted that Mr. Val Weston has remarked that the colour of these birds' legs is a far clearer brighter yellow than is the case with ordinary Pintail.

Distribution.—There is not much to add to Blanford's note on the distribution of this species. He writes:—"The Pintail Snipe breeds, as far as is known, in Eastern Siberia as far West as the Yenesei Valley and migrates in winter to South-Eastern Asia and the Malaya Archipelago. It is very rare in the Punjab, Sind and the North-Western Provinces, Rajputana and Gujrat; but increases in numbers to the Southward and Eastward and is found throughout the Peninsula in winter, predominating in Mysore and Southern India, whilst in the highland of Deccan, in Bombay and the Central Provinces and even somewhat further South the common snipe is more abundant and, whilst in Orissa and Bengal the two species are on the whole equally distributed everywhere, further East, in Assam, Sylhet, Cachar and throughout Burma. *G. stenura* is the snipe of the country."

It must be remembered that Blanford gives the Indian distribution in its widest sense. Throughout the Eastern portion of its Indian range the number of Pintail compared with Fantail varies very greatly in accordance with seasons, and sportsmen have to be very careful how they form their opinions on this subject.

The Pintail, without doubt, enters India *via* the Eastern Himalayas, comparatively few coming through them even as far West as Nepal. The Fantail, on the other hand, though migrating principally from the West, comes also in some numbers over and through the Eastern Ranges. But the Fantail arrives later than the Pintail so that to the East the Pintail predominates enormously during the early and late periods of its stay in India, that is to say, just after and just prior to its migration.

In this way a sportsman, who shoots in Cachar in September,

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may find nothing but Pintail in his bag, whereas one shooting in the same district in December may find but few Pintails and nearly all Fantails.

In Eastern India the Pintails arrive early in August, but there are a few records of snipe being killed in July. Fasson writes *in epistola* to Hume: "I have flushed snipe in the Hill jungle in June; and Jarbo, up at Rangamati in the Hill tracts, shot half a dozen couple on the 31st July last."

Those seen in June were probably birds which had been wounded and therefore unable to migrate, whilst the occurrence of the others in July must have been abnormally early. The record of the first snipe to be shot each year in the Chittagong District has been recorded by "Politye" in the *Indian Field* of 9th July 1903 for the years since 1878, and according to this record the next earliest dates to those mentioned by Fasson were on the 6th August 1892 and 1st August 1886. Mr. Val Weston says that the Pintail Snipe sometimes puts in an appearance in Birbhum in the last few days of July but does not seem to have shot any in that month and such appearances must be unusual, for in 1903 he records the first snipe as being shot on the 23rd August.

"Raoul" in the *Indian Field* of the 26th July 1909 records having seen three snipes on the 20th of that month and again that in 1873 he saw snipe on the 13th July; but these notices of seeing snipe can hardly be taken into consideration as actual records, for there is always the *possibility* of other little waders having been taken for them.

In Dibrugarh the first few birds arrive about the 4th August, in Chittagong about the same time, in Cachar, in Jalpaiguri and the Himalayan Terai they arrive about the 12th of that month and in Nepal a little later still. Thence they work South and West, arriving in Ceylon in October, and seldom before the end of that month in any numbers.

The maps which accompany this article will show how the distribution of the Pintail and Fantail overlaps, as well as the approximate dates on which the earliest individuals of each species arrive at their respective destinations. The routes are marked in red and from these it will be seen that the Pintail seems to move more

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MIGRATION ROUTES OF THE PINTAIL SNIPE (GALLINAGO STENURA)

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diagonally, that is more South and West, than the Fantail does South and East and also to migrate further South as a body. Thus at no period of its stay in India is the Fantail altogether absent from the Northern portion of its range but in December and January hardly a Pintail is to be found in the extreme North-East of India, nearly all the birds having gone further South by that time. In February they recommence working North, and by March have again deposed the Fantail from its position of numerical superiority in North-Eastern India.

The Pintail is as nocturnal in its habits as are other snipe and like the latter normally migrates, by night, but a curious instance of diurnal migration has been reported to me by Mr. L. W. Middleton. He writes:—"On September 8th I went out in the morning to see if the snipe were in and shot six and put up over thirty, so, in the afternoon, about 5 o'clock I again went out, thinking I was going to have a merry time but I only saw three and of those two rose straight up and joined a whisp of eight or ten which were crossing over at the time. I only found two more and then sat down to watch, and whilst so doing actually saw five rise and join flights of others which were passing over. I saw fully ten small lots came into view and make across the Hills in a South-Westerly direction. Next morning I went down early and trudged for an hour without putting up a bird, but I must have seen several hundred crossing overhead, one lot alone numbering fifty to sixty birds. The day was a bright sunny one and exceptionally hot."

Mr. Middleton's letter was written from Gauhati, and the Hills, he refers to, are the Khasia Hills. It is interesting to note how he remarks on these snipe working from one hill range to another instead of down the valley in which he was shooting.

The Pintail Snipe differs a good deal from the Fantail in its habits and will often be found in situations never frequented by the latter except when driven there by heat or by being over shot. Very favourite haunts of the Pintail in Assam are the wide waste lands, of sun grass worn down by village buffalos to an average height of some 18 inches, here and there the land being almost bare, whilst in patches elsewhere the grass may be three or four feet high.

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During the rains water, often to a considerable depth, covers these spaces, but by October and November they are practically dry, and even in the rains there are nearly always portions which are a little above water level. The Pintail Snipe shelter and feed in these grass lands, keeping almost entirely to the drier portions though, if the right kind of food is present, they also frequent the wet patches and the marshy bits which are dotted about over the whole of its area. Hume remarks on the feeding grounds of the Fantail and Pintail as follows:—" Both the Pintail and Fantail affect cover and moist ground so that where both these luxuries exist, you will continually flush both species at the same spot; but the difference between them is that, while the Pintail, if unable to get both his requirements, will stick to grass and such like cover, even if there be little perceptible moisture in the ground, the common snipe in such case will stick to the wet ground even if there be little perceptible cover there. The consequence is that whilst you often get both birds in precisely the same ground, you will often find the Pintail apparently quite at home in dry grass land, stubbles and scrub jungle where the common snipe would never, except accidentally, occur, and again you will find the Fantail on almost bare mud banks of rivers and tanks, where it is the rarest thing in the world to meet a Pintail."

Personally I do not think that cover is so great a necessity to the Pintail as Hume would suggest; the fact is that a great part of this bird's food consists of tiny shells, insects and other objects found for the most part on dry land and not in water or mud; accordingly the bird frequents dry quite as frequently as wet land, naturally preferring to get cover as well when that is possible.

Mr. H. A. Hole found snipe (undoubtedly the Pintail) feeding in absolutely bare ploughed fields in Cachar. I have myself shot them in Dibrugarh in mustard fields, from which the crops had been cut, and every year numerous birds are shot in the race course of that place on practically bare, but wet, grass land, the grass being but an inch or two high.

In Bengal, the most common resort of both Pintail and Fantail is paddy cultivation and shallow *bheel* land which is covered with vegetation of some kind, but whereas the Fantail never leaves this

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under ordinary circumstances the Pintail will also often be found on adjoining dry grass lands and even in jungle.

Snipe-shooting is much the same whether one is after Fantail or Pintail and in Bengal in nine cases out of ten one covers the same country in pursuit of either or both.

Hume seems to have had unfortunate experiences in Bengal, for he writes:—"In one single spot in the Meerut District, on the Boorka Ganga, in the neighbourhood of Hastinapur, to my certain knowledge, over 700 couple of common snipe were bagged during December 1850 by different parties who visited the place . . . . I have never heard of any one place in Bengal, Burma or Southern India where anything like this bag of Pintail could have been made by any number of guns."

This statement of Hume's is, of course, very far wide of the mark; in Bengal there are many such places, in Assam a few and in Burma and Orissa others.

In the Sundarbands of Barisal, Khulna and Jessore there are many wide sketches of mingled *bheel* and rice cultivation where a party of seven guns would *have to shoot very badly* in order to miss getting 700 couple in ten days' shooting. In the famous Kanchrapara jheels in the eighties and nineties 100 couple of snipe to one gun has often been exceeded in a day's shooting and this country was so well stocked that it stood shooting day after day. I well remember shooting there once in 1883 with three other guns. We unfortunately missed an overnight train and in consequence arrived late, so that when we got to our ground we found that the two best beats were already taken. In spite of this, our bag that day was 170 couple, whilst the other parties of shooters, who came into the station as we were waiting for our return train back to Nadia, shewed sticks as follows; the first party of three guns 180 couple, the next party of two guns something over 100 couple and a third party of four very bad shots, 48 couple. Here was a bag of something over 500 couple for one day and I believe one might have gone on shooting at the same rate for many days.

I do not think it is any exaggeration to say that in the season Kanchrapara must furnish over 1,000 couple of snipe month after month.

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Shooting in Nadia in 1883 when I was stationed in that district 40 to 80 couple was not considered a heavy *morning's* bag for a couple of guns; in Hooghly the same and in some of the rice fields quite close to the station bags of 75 to 125 couple to two guns was almost a common occurrence. Indeed in any of the good snipe districts of Bengal one does not call anything under 50 couple to one gun a good bag for a whole day's shooting.

In Orissa, I know of several bags of 100 couple to one gun obtained in places which could have held several guns for several consecutive days. Thus Mr. H. Cornish, to whom I have already referred, is credited with beating 100 couple twice in a week on the same ground near Cuttack.

Mr. H. Reily is said to have shot over 100 couple to his own gun in the same district and in Burma also over 100 couple has been obtained more than once. Shooting grounds such as these would furnish far more than 700 couple of snipe in a month unless the powder was of a very curious quality.

In some of the big Sylhet swamps bags of over 100 couple of snipe to parties of three or four guns are sometimes made, but there are few grounds which would give four guns five hundred couple in 20 days' shooting.

Cachar and the Assam Valley are even less productive of sport; in the former bags of 50 couple to a single gun are unusual and in the latter though, one comes across birds almost in thousands on rare occasions when they are migrating, the shooting is so difficult that big bags are exceptional; at such times also the birds themselves are on the move so that where one day the sportsman cannot shoot and load fast enough the next day he may not be able to scrape together five couple in five times that number of shots.

On one occasion I happened to be duck-shooting in North Lakhimpur in the extreme East of Assam when an enormous flight of snipe came in, both Pintail and Fantail. The day previous, we had been duck-shooting over the three principal *bheels* of that part of this district, perhaps putting up some 20 or so birds in the course of a 12 hours' shoot but after their arrival we could hardly move 20 yards without putting up one or more of them. That

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evening shooting round the skirts of the *bheel* two guns picked up 42 couple and found the birds so numerous that we decided to devote the following day to them alone.

The ground we were to shoot over had once been high forest land which had sunk until it formed a swamp in which there were some three or four feet of water all the year round. The trees had, of course, all died but the stumps of many of the harder grained ones were still standing, white and bleached and looking like the ghosts of their former selves. In the centre of these swamps shooting on foot was impossible as the water was still too deep, but all over the more shallow parts grew a dense mass of floating weeds a couple of feet thick and quite firm enough to walk on with care. There were three guns to take the field on this occasion, *viz*, myself, a second who was an average but careful shot, and a third, who could be called nothing but a rank bad one.

Before we got into the swamp itself we picked up a couple of teal and two snipe out of pools at the edge and as soon as we got on the weeds away went snipe in every direction. At first, the shooting was easy, the weeds firm and the water shallow and our first dozen or so shots collected 8 birds but after this we got into deeper stuff and the shooting got worse and worse. The birds still swarmed on all sides but they were rather wild and the weeds, though strong enough to hold us as long as we moved, gave way when we stood, so that our 'fore leg,' on which the weight was, sunk as we fired. Sometimes we sank slowly and fired after a fashion, sometimes we sank with a sudden disconcerting splash, it might be a couple of feet or it might be four and sometimes it was even more than this.

It was very exhausting work and after a couple of hours, having the fortune to get on a small island, we called a halt and looked at the bag. C, the bad shot, had fired 42 shots and had not a feather to show. Y, the cautious man, had had 30 shots to 12 dead birds, and I myself, shooting at everything within range, got 18 birds in 65 cartridges. After a short rest we tramped on once more but C, after loosing off another 40 cartridges or so and bagging one bird fell into a buffalo wallow up to his neck, and on

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being extracted from this he struck work and cleared off. Y and I persevered after we had lunched but with no better results until we struck a piece of good walking and here Y collected 5 birds in 7 shots and I was so fortunate as to get 8 consecutive birds. Then we got into deep stuff again and the average kills per cartridge again dropped. Eventually after the most exhausting day's shooting I have ever had we struck work at about 4 p. m. and totted up our bags. C had, before ceasing, fired 83 shots for one bird, Y, who had picked his shots all day, had got 44 birds in exactly 100 cartridges, and I had managed to collect 68 snipe in 204 shots, but of these 68, two I had shot before we started working the deep water and 8 I had got without a miss on a clean piece of walking so that really I had expended 194 cartridges in killing 56 snipe. It was no question of want of birds or of bad shooting as far as Y or myself were concerned, it was just the difficult walking and perhaps, to some extent, the attendant exhaustion. Each step one took, one was sinking more or less slowly the whole time with the consequence that the gunner was twice in every three shots under his birds.

The following day we abandoned the deep water altogether and Y and I worked round the edges and the across shallow stretches linking one swamp with another. In this way although we did not put up one-tenth the number of birds we had on the previous day we managed between us to pick up over 50 couple in under 200 cartridges.

The supposed differences between the Fantail and the Pintail in the matter of flight and voice have been much discussed, but I am ashamed to say that, to this day, I cannot tell one from the other when on the wing, nor could I ever, with any certainty, say what the bird was from its cry.

Other sportsmen and field naturalists, however, seem to find no difficulty in discriminating between them. Hume gives his own opinion as follows: "I individually am certain, that all conditions being identical, the flight of the Pintail is more laboured, and more direct, and less zigzaggy than that of the Fantail."

"As to the notes of the two birds, I am at a loss to understand how any one can assert that they are identical." At this point

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Hume stops and forgets to tell us how to say what cry belongs to which bird. Some of his correspondents try to show in what they considered the difference exists. Stuart says: "It rises with a sharp loud cry unlike the ordinary snipe, and its flight is heavier."

Parker says that the Pintail has a more laboured flight than the Fantail.

Brooke also *thinks* that the cry is different and the flight rather slower and not so zig zag.

On the other hand we have observers like Baldwin, Scully and Butler, all declaring that they can find no difference in voice or flight between the two birds.

That some men can tell the difference is a fact as I found out one day at the cost of one rupee per bird. I was shooting with a friend who called out as a bird dropped "Hallo, that's a Pintail." It was so right enough, but my sceptical nature made me think it was a fluke his guessing correctly and I told him so. Thereupon he bet me a rupee a bird that he would name the next ten birds he should kill, and this he proceeded to do perfectly correctly and named as they fell, 6 Fantail and 4 Pintail. This sportsman, however, said that the voices were identical, but that the Fantail got up vertically and then cleared off whilst there was a perceptible pause as it changed direction; the Pintail, on the other hand, rose on a slant and kept going. He had never noticed any difference in their zig zagging as Hume calls it.

What is the best weapon for snipe? A difficult question to answer, and to every sportsman the answer would not be the same. Hume, we see, advises a 20 or 24-bore with a dram of powder, but this necessitates the man behind the gun being a brilliant shot and also the snipe being comparatively domestic in their habits. For a long day's shoot there is no doubt that the lighter the gun carried, the less tired the shooter will get and the less his shooting will deteriorate by the end of the day. There are few men, however, who are not strong enough to use a 16-bore throughout the longest day; personally, though I rejoice in but one arm, I find a 16-bore perfectly manageable at the end of the hardest day's tramp; and though I used a 20-bore one season I dropped it because I could not shoot straight enough with it, and also found

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that when snipe were wild it did not kill the birds hit, the range of the weapon being insufficient.

The probable answer to the question is let each sportsman find out what suits him best, and when he has found out stick to the weapon as long as he can. If he starts with no bias for any special bore, let him commence his shooting with a 16-bore, and he will *probably* eventually find this light enough to carry, yet giving a sufficiently good pattern and with enough penetration to satisfy all his wants. I would not, however, ever advise a youngster to start with a 20-bore, much less with a 24.

On the table the Pintail does perhaps often rank as inferior to the Fantail. At their best the two birds are undistinguishable, but after a drought and when shot in scrub, the Pintail is often comparatively dry eating, a result which might be expected from the diet on which he has been living.

The bill of the Pintail snipe is not nearly so sensitive as that of the Fantail, and accordingly, we find him feeding far more on comparatively dry ground, boring less in the ground and indulging more on whatever he can get above it. A very large proportion of his diet consists of tiny snails and similar "shell fish" which are to be found in and about the roots of grass, etc., on damp ground, or else climbing up the blades to some height. But besides these and the worms, caterpillars and other soft items of food, all of which are also eaten by the Fantail as opportunity arises, the Pintail will eat grasshoppers, small beetles, and other equally hard substances, and I have shot birds in dry scrub with the stomachs full of a small kind of flying ant.

Nidification.—Very little is known about the nidification of the Pintail Snipe, though very recently Dresser has obtained its eggs through Russian collectors.

Seebohm visited its breeding grounds when they commenced to arrive in the first week of June, but he appears to have left before they begun to nest.

Prjevalsky gives a good account of its breeding on the Ussuri, though he calls it *G. heterocerea*. He says:—"In the latter half of April the birds choose their nesting localities in the thinly overgrown marshes, and their peculiar courting commences. Rising

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into the air similar to our *G. scolopacina*, and describing large circles above the spot where the female is sitting, it suddenly dashes downwards with great noise (which is most likely produced by the tail feathers, like that made by our species and somewhat resembles the noise of a broken rocket). As the bird approaches the ground, the noise increases until it has got within a hundred yards, when it suddenly stops the sound and quietly flies on, uttering a note sounding something like *tiric, tiric, tiric*. Courtship lasts until the middle of June and is mostly heard or seen in the mornings and evenings, but occasionally in the day-time and even at night in the clear weather."

I was fortunate enough to take an undoubtedly authentic nest of this snipe on the 21st June 1890 at Guilang in the North Cachar Hills. Some Nagas brought me a pair of snipe, which they had trapped in a wide ditch surrounding a deserted Stockade, and on a search being made in the banks of this ditch a nest with four eggs was discovered. The two birds *appeared* to be quite sound in every way, but it is almost certain that one of them must have received some injury which prevented it migrating to its usual nesting ground though it had left the plains with the intention of going there.

The bottom of the ditch in which the nest was placed contained a little water, but the banks were only slightly moist and spongy and where the nest was placed in amongst the roots of long grass, it was quite dry. The nest was a circular pad of fine roots and grasses with a depression in the centre of about half an inch. It was curiously well and compactly put together, though there was no attempt to weave or intertwist together the articles of which it was composed.

The eggs, which were fresh, were four in number and averaged 1·48″ × 1·12″. The ground colour is a very pale, but rather right yellow stone, and the markings consist of very bold blotches and spots with one or two long scriggly lines of deep vandyke brown. These are nearly all confined to the larger third of each egg, only a few spots and specks being present in the smaller two-thirds. The underlying marks consist of blotches of purplish grey scattered about the egg in the same proportion as the primary markings.

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The texture is fine and close and there is a fair gloss; the shape is the usual broad peg-top of all snipe's eggs.

Mr. H. A. Hole wrote me in 1890-1892 that he was sure that a certain number of snipe bred every year in the plains of Cachar, and that he had frequently put up snipe in the newly ploughed fields in June, July and August.

In 1890 and the following year he failed to obtain any eggs, but on the 14th June 1902, he got, amongst a great number of painted snipe's eggs, a clutch of three and a single egg which are undoubtedly true snipe's eggs and almost equally, certainly, those of the Pintail.

In both these cases the nests were found on the *bands* or banks bordering rice fields and were placed at the water's edge in dense grass and weeds. The rice fields in this part of Cachar are very small and consist of the low ground running between and around the small broken hills at the foot of the higher ranges. They are, as usual, divided by narrow banks of a foot or two in height, but in country of this character the borders of the field and the banks themselves are always much overgrown with grass, weeds and small bushes.

All four of these eggs are of the same type as those described above, merely differing in having a somewhat greener ground colour and the markings rather less heavy and more evenly distributed. They average 1·58″ × 1·11″.

I have also an oviduct egg in my possession which was taken from a female Pintail in the early part of August 1889, shot by some one in Cachar on the *bheel* surrounding the Rifle Range. The bird was dissected and the egg sent me by the late Col. Evans, I. M. S., at that time attached to the Regiment stationed in Silchar.

This egg differs from all others I have seen in being very dull in colour and curiously brown in general hue. The markings are like those in the Silchar ones, but have the distribution reversed, *i.e.*, they are principally confined to the smaller instead of the larger end.

The underlying spots are also unusually dark, and are of a purplish brown. The egg measures 1·55″ × 1·14″.

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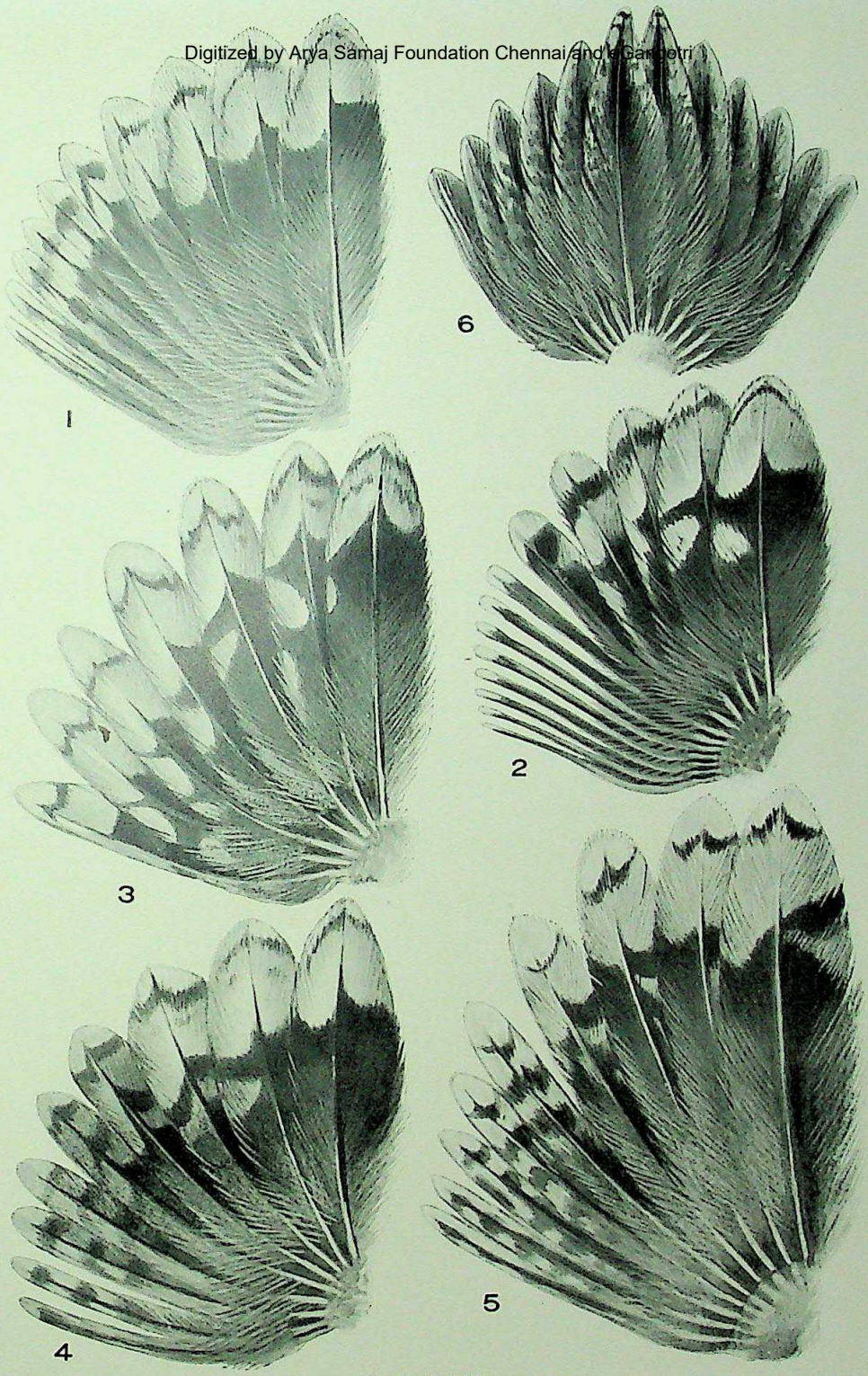

TAILS OF SNIPE.

1. SWINHOE'S SNIPE (*G. megala*). *Note* 20 tail feathers, outer 12 attenuated.
2. PINTAIL SNIPE (*G. stenura*). *Note* 26 tail feathers, outer 16 *much* attenuated.
3. COMMON SNIPE (*G. gallinago*). *Note* 14 tail feathers, none attenuated.
4. WOOD SNIPE (*G. nemoricola*). *Note* 18 tail feathers, outer ones narrow.
5. EASTERN SOLITARY SNIPE (*G. solitaria*). *Note* 18 tail feathers, outer 6 narrow.
6. JACK SNIPE (*G. gallinula*). *Note* 12 tail feathers.

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Another oviduct egg was also once obtained in Cachar from a Pintail snipe. I think this was in August 1887 or 1888, but am not sure of the date and the shell being still soft, the egg was not preserved.

GALLINAGO MEGALA.

Swinhoe's Snipe.

Gallinago megala.—Swinhoe, Iho., 1861; Legge, B. of C., p. 817; Oates, Game Birds, ii, p. 475; Sharpe, B. M. Cat., xxiv, p. 624; *id.*, Hand-list, Vol. i, p. 165. Dresser, Bulletin, B. O. U., No. clvi. *Indian Field*, 8th October, 5th, 12th and 16th November 1903.

Scolopax megala.—Seebohm, Geogr., Dist. Charadr., p. 479.

Description.—Adult male.—Swinhoe's snipe is in colouration undistinguishable from the Pintail Snipe, but can always be identified by an examination of the tail. This in Swinhoe's snipe contains only 20 tail feathers, whereas the Pintail Snipe normally has 26 tail feathers and practically never less than 22. Even, however, when the tail is imperfect discrimination is easy for whereas the outer tail feathers of the Pintail are hardly broader than a pin those of Swinhoe's snipe are never under 2″. Again the Pintail has 8 or 10 of the central feathers non-attenuated whereas Swinhoe's has only the 6 central ones showing no attenuation.

"Bill light yellowish brown for the basal two-thirds, yellower on the base of the upper mandible, blackish brown on the apical third; feet light yellowish grey, with blackish brown claws; iris dark umber-brown" (Swinhoe).

"Total length 9·5 inches, culmen 2·3″, wing 5·4″, tail 2·15″, tursus 1·35″" (Sharpe).

Two adults in the Calcutta Museum from Foochow have wings of 5·42″ and 5·45″, respectively.

Adult female.—Similar to the male, but rather larger, "legs and feet pale bluish grey, nails black" (A. H. Everett). A bird sent me from the Shan States has the legs rather bright yellowish grey. The wing measures 5·64″ and the skin is almost certainly that of a female.

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"Total length 10·5 inches, culmen 2·6", wing 5·6", tail 2·15", tarsus 1·35" " (Sharpe).

"*Young Birds.*—As with *G. stenura* so with the present species, the young birds appear to be distinguishable by their more uniform dark brown throat and chest; the stripes on the sides of the brown are also black and not mottled with rufous" (Sharpe).

Normally Swinhoe's Snipe is a bigger bird than is the Pintail, but the difference in size is not sufficiently marked to make it a factor of any use for the purposes of identification. Thus a specimen of the former in the Calcutta Museum, probably a young bird, has the wing only 5·08", whereas the Pintail often has the wing up to 5·5".

Distribution.—*Gallinago megala* breeds in Eastern Siberia and Northern China, migrating South in winter to Southern China, the Philippines, Borneo and the Malaccas. It is possible also that it breeds in Japan, though Alan Owston tells me that he has so far never heard of its doing so.

As far as known, for certain, the record of its occurrence within the limits of the present work are two only in number. A skin of a bird, already referred to, was sent me from the Shan States in December 1908, and a second was shot by me in Dibrugarh in January 1903.

This snipe is essentially a far Eastern form, but there is no reason why it should not be found fairly constantly in Burma and also, occasionally, in Assam and the extreme East of Bengal. Unfortunately *casual* examinations of big bags of snipe are of no use in ascertaining whether specimens of *megala* form a part with others, but if sportsmen will take the trouble to examine the tail of those shot really carefully, there can be but little doubt that we shall soon obtained further records of its visiting India, more specially in its extreme Eastern limits.

There is practically nothing in record about this snipe, although it is common enough in its own habitat. It is only within the last two years that its nidification has become known, and even such records as these are confined to Russian works. Dresser informs me that he has received eggs from Buturlin which were taken in Eastern Siberia.

(To be continued.)

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ORCHIDS OF THE BOMBAY PRESIDENCY.

BY

G. A. GAMMIE, F.L.S.

PART XI.

(Continued from page 129 of this Volume.)

We now come to the third tribe the *Neottieæ* of which the general characters were given on p. 433 (Vol. XVI). It consists (in Bombay) of 3 genera of small, terrestrial orchids. These may be shortly differentiated as follows :—

Leaf single from a small underground *tuber*, cordate fanshaped, appearing after the *scapes*, which are few flowered, *sepals* and *petals* narrow, spreading, *lip* undivided or 3-lobed ..... 25. Pogonia.

Leaves few, alternate, *roots* of tuberous fibres, *flowers* numerous, white, small, crowded in spiral spikes ..... 26. Spiranthes.

Leaves small, gradually passing into the bracts, *flowers* small, in dense racemes, *dorsal sepal* forming a *hood* with the *petals*. 27. Zeuxine.

Stems short, densely leafy, *leaves* very thin and netted veined, *flowers* few, in short racemes, *sepals* united half way into a tube. 28. Cheirostylis.

25. *Pogonia.*

Low, terrestrial, tuberous herbs, flowering before the leaves appear. *Leaf* plaited, solitary, broadly cordate or orbicular. *Flowers* solitary or few, nodding, near the apex of the *scape* rising from the tuber, *sepals* and *petals* subequal, narrow, spreading, *lip* adnate to the base of the column, sessile, narrow, 3-lobed, slightly saccate, *column* elongate, curved, clavate, *stigma* oblong, *pollinia* 2 or 4, elongate, powdery, often coherent, without *caudicle* or *gland*.

Leaves purple, covered with vinous coloured hairs, veins about 15, *sepals* and *petals* dull white, *lip* entire, pink ..... 1. P. plicata.

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Leaves green, glabrous, veins 7 or 9, *sepals* and *petals* greenish brown, *lip* 3-lobed, pink. 2. P. carinata.

1. POGONIA PLICATA, *Lindl.; Fl. Br. Ind., VI., p. 119*; *T. Cooke, Fl. of Bombay, II, p. 707.*

Tuber globose, ¾ inch in diameter, tuberiferous *suckers* springing from the petiole into the soil. *Leaf* orbicular cordate, about 4 to 5 inches in diameter, dark brown purple on the *upper surface* which is densely covered with thick, stiff, vinous coloured hairs, *sinus* folded, *under surface* lurid vinous purple, also clothed with the same hairs as on upper surface, *veins* arched flabellate, about 15 in number, raised on both surfaces, not channelled but slightly winged on lower surface. *Scape* slender, 3 inches long, invested with *sheaths*, the lower of these short, truncate, the *upper* elongate with a free, linear acuminate blade as long as the sheath. *Flowers* 2 on each scape, nodding, 2 inches and over in diameter, semi-patent, *bracteoles* small, very shortly sheathing, 2-or more-sected, *ovary* short, stout, inversely top-shaped, 6-keeled, *sepals* linear-oblanceolate, smoky white, tips falcate, nerves brown, *petals* similar but broader, *lip* with entire margins, ⅜ inch long, embracing the column, bright rose, with darker veins, a stout, white, linear *callus* passing through the centre to the dilated emarginate tip, where the margins are strongly recurved, column club-shaped, *anther* cup-shaped, *rostellum* obscure, *stigma* scarcely depressed.

Flowers appear immediately on the setting in of the rains about the middle of June. They survive a very few days only and are followed by the leaves which lie spread out on the ground.

Distribution.—Throughout the Western Ghats, more especially so to the southward, Bengal, Mysore and Western Peninsula generally.

2. POGONIA CARINATA, *Lindl.; Fl. Br. Ind., VI, p. 121*; *T. Cooke, Fl. of Bombay, II, p. 707; Dalz. and Gibs., p. 270.*

Tuber warted, globose, ½ inch in diameter, tuberiferous *suckers* springing from the petiole into the soil. *Leaf* 2½ inches in diameter, orbicular cuspidate, deeply cordate, green and glabrous, nerves 7 to 9, brown, petiole purple, 1½ inch long, flowers nodding, solitary, on *scapes* 3 inches long, *lower bracts* elongate, sheathing, upper below the flower, shorter, with an acuminate tip about ½ inch long, *sepals* and *petals* spreading, similar,

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linear acuminate, greenish brown, about one inch long, *lip* $\frac{3}{4}$ inch long, 3-lobed, side lobes yellow, oblong rounded, embracing the column, *midlobe* $\frac{1}{3}$ inch long, ovate oblong, subobtuse, or mucronate, crenulate, pink, with a central linear white *callus*, *ovary* pink, *column* green, curved club shaped, *anther* shallow, *pollinia* 4, cohering in pairs.

Flowers appear at the beginning of the rains in June to be followed by the leaves in July.

Dr. Cooke says that the flowers are numerous in each raceme of this species. I have never found more than a solitary flower, although I have cultivated many plants for years. As regards the description in every other respect, this agrees exactly with that given by Sir J. D. Hooker and T. Cooke, so that I am probably correct in looking upon it simply as a western form of *P. carinata*.

Distribution.—Bengal and Western Peninsula, common in pastures on the Ghats.

Note.—I have an incomplete description of yet a third species from the Belgaum Ghats. Although I had the plant in cultivation for some years I either missed seeing the flowers or they may have never appeared. The following is all the information I have on it at present:—

Leaf orbicular cordate, *sinus* open, *blade* up to 5 inches in diameter, green, clothed with very short, stiff white hairs above, quite smooth and grey punctate beneath, *veins* about 18 in number, raised and slightly channelled on the lower surface, impressed on the upper. *Leaves* appear towards the end of June.

26. *Spiranthes.*

Terrestrial herb, with tuberous fibrous *roots*. *Leaves* clustered near the base of the stem, shortly sheathing. *Flowers* small, on a twisted, erect, secund, glandular pubescent *spike*, *petals* more or less connate with the *dorsal sepal* into a hood, *lip* 3-lobed, not spurred, *column* short, cylindrical, *anther* erect, 2-celled, *pollinia* 4, united in pairs, sessile on a small *gland*.

1. SPIRANTHES AUSTRALIS, *Lindl.*; *Fl., Br. Ind., VI., p. 102*; *T. Cooke, Fl. of Bombay, II, p. 707*; *Dalz. and Gibs., p. 270.*

Whole plant 6 to 18 inches high. *Leaves* 4 to 5, 1 to 5 inches long, very variable, linear or linear-lanceolate, acute or acuminate, sometimes oblanceolate, shortly sheathing. *Spikes* slender, 3 to 6 inches long, *bracts* ovate acute, exceeding the sessile *ovary*, flowers $\frac{1}{10}$ to $\frac{1}{6}$ inch long, white, *sepals* ovate oblong acute, *petals* slightly

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shorter, linear obtuse, more or less connate with the dorsal sepal into a hood. *lip* oblong, crisped, base saccate, 2-glandular, tip dilated, retuse or apiculate, *disk* hairy, *pollinia* cohering, clavate.

Flowers appear in the cold weather.

Distribution.—Said by T. Cooke to be very rare in the Bombay Presidency. It has been recorded from the Konkan, Ghats of the Southern Mahratta Country and North Kanara by Stocks, Dalzell and Gibson. It has been found on the higher elevations of the Nilgiri Hills, and is common along the Himalayas. It also occurs in Ceylon, Central and Northern Asia, China, Java, Australia and New Zealand.

27. *Zeuxine.*

Terrestrial herbs, *stems* creeping below, fleshy. *Leaves* membranous, scattered. *Flowers* small, spicate, *sepals* subequal, *dorsal* concave, forming a hood with the *petals*, *lateral* free, *petals* like the dorsal sepal, *lip* adnate to the base of the column, boat-shaped or saccate, *terminal lobe* shortly clawed or sessile, entire, 2-lobed or 2-winged, *sac* with 2 *calli* or *spurs* near the base within *column* which is very short, 2-keeled or winged in front, *stigmas* 2, lateral, distant, *anther* membranous, its cells contiguous, *pollinia* pear-shaped, attached by an oblong *gland* to the erect *rostellum*.

Leaves linear, sessile, *lip* hammer headed... 1. Z. sulcata.

Leaves ovate petiolate, *lip* with a deep 2-lobed obovate, wedge-shaped *midlobe* ... 2. Z. longilabris.

1. ZEUXINE SULCATA, *Lindl.; Fl. Br. Ind., VI, p. 106; T. Cooke, Fl. of Bombay, II, p. 708.*

Plant 2 to 12 inches high. *Leaves* 1 to 2 inches long, linear acuminate, erect, sessile on the sheaths, gradually passing into the linear bracts upwards. *Racemes* ½ to 2 inches long, densely flowered, *sepals* unequal, white, *dorsal* ⅓ inch long, concave, ovate obtuse, *lateral* smaller, obliquely ovate-oblong subobtuse, *petals* white, slightly shorter than the dorsal sepal, falcately oblong obtuse, forming a hood over the column with the dorsal sepal, *lip* yellow, equalling the sepals, boat-shaped, contracted into a short pubescent claw bearing a hammer-headed *terminal lobe*, *column* short, with 2 wings at its apex covering the *anther*, *pollinia* clavate, sessile on an oblong gland.

Flowers during the cold season.

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Distribution.—The commonest ground orchid in India, more especially in damp localities, found throughout the whole country and extending into Ceylon, Java, China, Japan and Philippines.

2. ZEUXINE LONGILABRIS, *Benth.; Fl. Br. Ind., VI, p. 107; T. Cooke, Fl. of Bombay, II, p. 709:* Monochilus longilabre, *Lindl.; Dalz. and Gibs., p. 271.*

Plant slender, about 6 to 10 inches high. *Leaves* few, distant, 1 to 1½ inch long, shortly stalked, ovate or ovate-oblong, acute, base rounded. *Scape* 4 to 10 inches long, slender, pubescent, with 2 or 3 distant lanceolate *sheaths*, *flowers* few, on a glandular pubescent *rachis*, *bracts* about equalling the pubescent *ovary*, *sepals* ¼ inch long, pubescent, green, oblong obtuse, *petals* white, ½ inch long, *lip* ½ inch long, with a *claw* which is saccate at the base, *sac* with 2 *spurs* within, *terminal lobe* obovate cuneate, deeply 2-lobed, lobes toothed on the outer margin, *anther* beaked, *pollinia* pear-shaped, adnate for about two-thirds of their length to the linear appendage of the small *gland*.

Distribution.—Seems to be rare in the Bombay Presidency. It has been recorded from the Konkan by Law and Stocks. It occurs in Bengal, Assam, Western Peninsula and Ceylon.

28. *Cheirostylis.*

Terrestrial herb, whole plant translucent when dry, lower part of *stems* succulent. *Leaves* membranous. *Flowers* few, small, subcorymbose, *sepals* connate into a gibbous tube in their lower half, *petals* narrow, shorter than the sepals. *Lip* inserted at the base of the column, the *sac* with enclosed *calli*, *limb* shortly clawed, broadly dilated, entire, toothed or crenate; *column* short, with two long fleshy appendages in front, *rostellum* 2-cleft, *stigmas* 2, lateral, *anther* erect, its *cells* short, *pollinia* 2, bipartite, *caudicle* short, *gland* oblong.

1. CHEIROSTYLIS FLABELLATA, *Wight.; Fl. Br. Ind., VI, p. 105 T. Cooke, Fl. of Bombay, II, p. 709; Dalz. and Gibs., p. 271.*

Plant 4 to 10 inches high, *stem* sometimes moniliform below. *Leaves* very thin, about 1 inch long, ovate acute, 3-nerved and reticulately veined, *base* rounded or subcordate, *sheaths* loose, of a glossy texture, *petioles* about ½ inch long. *Scape* 6 to 8 inches long, glandular pubescent, *bracts* ⅛ to ⅙ inch long. *Flowers* 2 to 10,

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white, glandular pubescent, *sepals* $\frac{1}{5}$ inch long, united half way into a ventricose tube, the *lobes* ovate oblong, *petals* with exserted tips, falcately linear oblong, *lip* $\frac{1}{4}$ inch long, with a short saccate *claw* which has two enclosed *calli*, *base* hairy, *limb* broad, spreading, sub-orbicularly 2-lobed, *lobes* sub-5-fid, *column* very short, appendages and arms of the *rostellum* subspathulate, *anther* with a dilated membranous tip, *pollinia* 2, pear-shaped, subsessile on the elongate lanceolate *gland*.

Flowers appear from March to May.

Distribution.—Belgaum and North Kanara Ghats, Western Peninsula, Ceylon, Eastern Himalaya, Burma.

(To be continued.)

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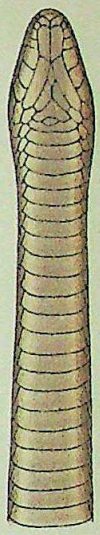

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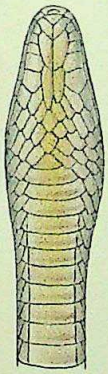

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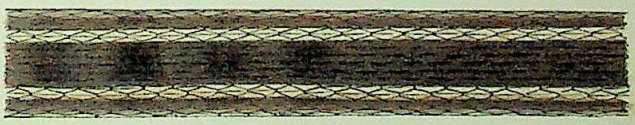

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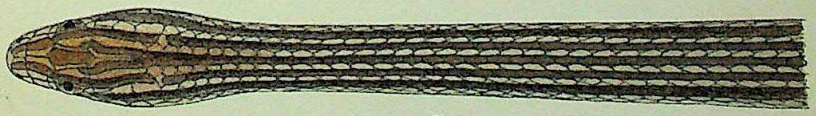

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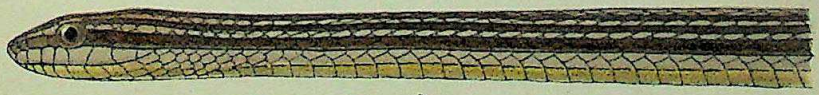

8.

J. G. del. J. Green, Chromo.

THE COMMON INDIAN SNAKES. (Wall).

1–6. Tropidonotus stolatus, *harmless, nat. size.*
7–9. Psammophis condanarus, *poisonous, nat. size.*

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A POPULAR TREATISE ON THE COMMON INDIAN SNAKES.

ILLUSTRATED BY COLOURED PLATES AND DIAGRAMS.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

Part XIV with Plate XIV (Diagrams I and II and Map).

(Continued from page 79 of this Volume.)

The genus *Tropidonotus* is one of 242 into which the family *Colubridæ* is divided, and belongs to that "series" which is characterised by the absence of any grooved, or tubular teeth, *viz.*, *Aglypha.*

It is one of the most widely distributed of all the ophidian genera, representatives occurring in all five Continents.

It is divided into four sub-genera, *viz.*, *Tropidonotus*, *Nerodia*, *Amphiesma*, and *Macropophis* on differences affecting dentition, but these names are not in common use. As the differences are quite as important as those claimed to differentiate many other closely allied genera, such as *Macropisthodon*, *Helicops*, *Pseudoxenodon*, etc., it is difficult to see why the major rank of genus has not been conceded by Mr. Boulenger who includes them all in a single cumbersome genus, *i.e.*, *Tropidonotus*. Of the 80 odd species included under this generic title-no less than 20 inhabit various parts of our Indian Empire.

TROPIDONOTUS (AMPHIESMA) STOLATUS.

The buff-striped keelback.—The species was referred to first by Carl Linnè in 1766 under the name *Coluber stolatus.* Russell figured it three times in his Volumes on the Indian Snakes published in 1796 (Plate X), and 1801 (Plates XV B and XIX).

Nomenclature (a) Scientific.—The generic name from the Greek τροπις a keel, and νοτυς the back was introduced by Kuhl in 1822 in reference to the ridges on the scales of a snake whose precise

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identity is not known. Boie in 1826 applied the title to our common English grass snake (*natrix*) which is therefore the type of the genus. *Amphiesma* from the Greek meaning "a garment" was initiated by Dumeril and Bibron in 1854, and applied to the snake under discussion, *viz.*, *stolatus* which is therefore the type. It is difficult to realise that anyone who has viewed the skulls of *natrix* and *stolatus* side by side can doubt the justification for dissociating them generically. In the former the maxillary teeth form an uninterrupted series, the last three or four of which progressively increase in size, but are none of them twice as long as the teeth in the middle of the jaw, see figure A. In *stolatus* there is a gap at the back of the jaw, succeeded by two subequal enlarged teeth fully twice as long as those at midmaxilla, see figure B, in fact the very condition which led Mr. Boulenger to separate three species previously included in *Tropidonotus*, under a new genus which he called *Macropisthodon*. See figure C. The specific name from the Latin meaning "dressed," and implying "decked" originated with Linnè in 1766. There is little doubt that the snake ought to be known scientifically as *Amphiesma stolatus*.

(*b*) *English.*—The "buff-striped keelback," is, I think, the most descriptive name for it, or for brevity "buff stripes."

(*c*) *Vernacular.*—Russell mentions "wanna pam," "wanapa pam," and "wanna cogli," as names by which it is known in South India. These are Telugu names derived from "vana" rain. The first two mean simply "rain snake," the second being the adjectival form of the first. Mr. Millard tells me that about Bombay it is called "wana kukroo" and "nanati." I heard it called "therlian" by the Malabaris about Cannanore. Colonel Dawson tells me it is called "churrutay" in Travancore, a word derived from "churul" a "coil," but the same name is applied to *Lycodon*, *Simotes* and other snakes. In Ceylon* Ferguson says it is called "ahara-kukka" and Mr. E. E. Green confirms this and tells me the words are Singhalese, the latter meaning "dog," and the former "food," but the name thus

* Rept. Fauna, Ceylon, page 20.

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interpreted is enigmatical*. In Bengal Theobald† says it is known as "halhalliah," and Mr. D'Abreu whilst confirming this by telling me that this is the name applied to it in Murshidabad, remarks that in Behar it is called hur-hur-ra a local word meaning with a rustle hur-hurra in Bengali means "restless" and is the name by which it is known throughout that Province.

In Burma it is called "mywe shaw" meaning "crawling snake" and "myit shaw" "grass crawler."

General characters.—It is a graceful little reptile with the body rather short, and the tail rather long, *viz.*, about one-fourth the total length of the snake. Anteriorly the body attenuates somewhat to the head, so that the neck is fairly evident, and posteriorly reduces perceptibly in girth to the vent, where in females specially a further reduction marks the commencement of the tail. Dorsally the body and tail are rough with the keeling of the scales, which last are lustreless. The head is rather depressed, evenly rounded from the crown to the side of the face, specially over the muzzle, and has the snout moderately narrowed. The eye is large with a round pupil, and an iris flecked with gold especially at the pupillary margin. The nostril is open, and occupies about two-fifths of the depth of the suture between the nasal shields, leaving about one-fifth of the suture uninvolved above, and about two-fifths below. The tongue is a dull orange colour at the base, and has black tips.

Colour and markings.—The ground colour is olivaceous-brown of various depths of intensity, some specimens being dark, others light. A buff stripe beginning in the neck or forebody, at first obscure but becoming well defined, and conspicuous, passes down each side of

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* Further enquiry brings to light the following story from old Ceylon records. It appears that the old Ceylon Kings kept a jester about the Court, and on one occasion at a garden party the King came across a snake called Ahan-kukka (Synonymous with the Pali word for the tame snake man-balla), meaning literally "ahan" I am, "kukka" a dog. He called for the jester, and seeking to have some fun at his expense, asked him before his courtiers and assembled guests the name of the snake, but the jester was quickwitted enough to discover the King's intention and replied untruthfully "ahara kukka" meaning "a dog looking for food" since which the snake has been so known.

† Cat., Brit. India, page 177.

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the back to the tail tip. These involve one whole and two half rows of scales, and are separated from one another by five whole and two half rows. The ground colour is further ornamented with black, or blackish somewhat irregular crossbars which are always most obvious anteriorly, and often wholly disappear before the vent. The head is olivaceous-brown fading laterally to pearly-whitish, yellow or orange on the lips. There is I think always a blackish vertical short loreal streak, and generally some of the last supralabials are margined posteriorly with black. The chin is whitish, and the throat pearly-white, pale or bright yellow, or orange, these vivid hues being seen alike in some specimens of both the blue and red varieties. The belly is pearly-whitish with generally some roundish, scattered small, lateral black spots, chiefly anteriorly. Often an ill-defined pinkish or lilac suffusion is to be seen at the edge of the ventral shields. When desquamation is impending much of the beautiful colouring may be obscured but when once the little snake has divested itself of its old and seedy looking raiment, it is just the little dandy that its specific name implies.

Varieties.—Two distinct colour varieties are to be met with, one which may be styled the *forma typica*, and the other for which I propose the name *erythrostictus*.

Variety (A). *Forma typica.*—In this the overlapped margins of the scales, especially towards their bases are adorned with blue-grey or pale-blue often of a shade almost identical with that very beautiful flower *Plumbago capensis*. This ornamentation is concealed by the imbrication of the scales when the snake is quiescent, and only comes into view when the snake under alarm or excitement inflates itself. It is much more conspicuous, or may be wholly confined to the anterior half or third of the body. This is the common type which is universally to be met with throughout the area of its distribution in Plains and Hills alike.

Variety (B). *Erythrostictus.*—In this the far more beautiful variety, bright vermilion, replaces the blue adornment of *forma typica*. The vermilion however is usually if not always more extensively distributed than the blue of the last variety, so that it is usually more or less evident even in the quiescent state of the

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snake. Specimens so ornamented frequently have a speckling of the same hue on the belly, and in many though not in all the throat is yellow or orange.

This variety is very local being as far as I am aware confined to the coasts of India, and even here is far less common than *forma typica* with which it is associated. I met with it most commonly on the West Coast in Cannanore where one-third of my specimens (16 in 47) were of this variety and have had specimens sent to me by Colonel Dawson from Travancore. Mr. Millard tells me he has never seen it about Bombay, but for all this I feel sure it must occur, for Murray mentions it in Sind presumably on the coast though he does not say so. I have seen three specimens from Madras sent by Mr. Dwane to our Society from one of which our coloured figure is taken. Dr. Günther* says Mr. Walter Elliot has figured such a specimen from Madras. I also met with it not infrequently in Rangoon. Nicholson † remarks that the varieties of this snake found in Malabar and Burma show the finest display of interstitial colours, by which I think he alludes to the vermilion variety for this is the one he figures. Theobald ‡ also remarks on the vermilion seen in specimens from Burma, and both he and Murray say that this brilliant suffusion is a seasonal manifestation. Whether these observations were made independently or Theobald simply reiterated Murray's words I cannot say, but I am fully convinced that neither the vermilion ornamentation, nor the brilliant yellow and orange gorgets seen in some specimens are seasonal. Dr. Günther's remarks on Mr. Walter Elliot's painting of a ♂ specimen with a yellow throat and vermilion adornment seem to imply that these highly decorative hues are acquired in the breeding season, but this is not the case, nor are they the prerogative of either sex, nor the insignia of maturity.

In Fyzabad I had two ♂ hatchlings on successive days, *viz.*, 25th and 26th October, one of which had a white throat, whilst the other had a bright yellow suffusion extending to the lips. On the 7th of November in the same year (1905) I had a ♀ adolescent 9⅝ inches

* Rept. Brit. Ind., p. 267.

† Ind. Snakes, Plate xv. fig. 1. ‡ Cat. Brit. Burma. p. 47.

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long with a bright canary gorget. Specimens with and without this adornment are to be met with of all ages and throughout the whole year, and I had vermilion specimens in Cannanore in the months of November and December.

I cannot say whether vermilion ♂ ♂ mate with vermilion ♀ ♀, or whether the two varieties interbreed. It is very remarkable if as appears to be the case these vermilion specimens are confined to our coasts. I have noted in my article on *T. piscator* in this series that similarly ornamented specimens I had only known from the coast, and I may here mention that in Cannanore I once got a specimen of the Common Indian Toad (*Bufo melanostictus*) with flaming red blotches instead of the usual black spots. I did not recognise the species, but sent the specimen to the British Museum where Mr. Boulenger identified it.

Identification.—In the matter of identification it is as well to remark that the buff-striped keelback is one of the very commonest if not actually the commonest snake to be met with in the Plains of India, Burmah and Ceylon. It is almost certain to be one of the first dozen snakes the novice beginning to collect these reptiles will encounter and it is more than probable it will be included in the first half dozen. The two dorsal buff stripes are almost characteristic of the species and they are always well defined, and conspicuous. Longitudinal striping it may be remarked is unusual among our Indian Snakes and when it occurs, it is usually a dark stripe that occurs in the position occupied by the buff stripes in this species. Among exception with which *stolatus* might be confused must be mentioned *parallelus*, and *modestus*, of the same genus, and *Psammophis condanarus*. In *parallelus* and *modestus* the light stripes are ill-defined, and far less conspicuous and both species are found only in Hills, the former in the Eastern Himalayas, Assam and Burmah Hills, and the latter in the Assam Hills. In *parallelus* the ventrals are more numerous, and in *modestus* the subcaudals more numerous than in *stolatus*. The rows of scales would at once distinguish *Psammophis*, being 17 anteriorly and 13 behind.

As colour, and markings are at least uncertain guides in diagnosis, one should rely on scale characters and the following combination taken in the order herein placed will prove the readiest means I can

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suggest:—(1) Scales 19 in midbody, and 17 at a point two heads-lengths before the anus. (2) Nasals not touching the 2nd supralabial; (3) Rostral touching 6 shields and (4) a single anterior temporal.

Dimensions.—I have about 200 recorded measurements in my note-books and find that the length differs considerably in the sexes. Of ♂ ♂ I have only had 8 specimens of 1 foot 9 inches and over, of which only 4 reached 1 foot 10 inches the largest being 1 foot 10½ inches. On the other hand I have had 13 ♀ ♀ exceeding 2 feet in length. Two taped 2 feet 4 inches in Dibrugarh, and another 2 feet 5 inches in Fyzabad. Another specimen from Dibrugarh I judge to have been still larger, for the body was 1 foot 11½ inches, out of a total length of 2 feet 4 inches. In three ♀ ♀ in which the total lengths were 2 feet and ½ an inch, 2 feet 1½ inches, and 2 feet 1¾ inches, the tails measured 6 and 6¼ inches respectively so that at the lowest computation this specimen would have been if perfect two inches longer, and possibly three, making a length of 2 feet 6 or 7 inches.

Disposition.—This is a remarkably inoffensive little creature. Of all the snakes I know, it ranks among the most gentle, for I have picked it up scores of times in its native haunts, and I have never once been bitten or even struck at. Mr. Millard writes to me:—"It is the most gentle snake that I know. I cannot remember one ever having attempted to bite even when caught in the open." This placid disposition is all the more remarkable when one considers that the other common species of the same genus in the Indian Plains, *viz.*, *piscator* is among the most truculent of snakes. Little "buffstripes" is easily alarmed, and when danger threatens, turns, and glides off as rapidly as possible to any protection the nature of the ground may offer, and it is an adept in the art of concealing itself in the smallest patch of scrub or grass, sometimes vanishing in a most uncanny way. Probably it has found a hole and secreted itself therein, but a careful and systematic search sometimes fails to reveal the mystery of its disappearance. When brought into the open, it exhibits a lively activity making repeated attempts to escape.

When irritated some specimens but by no means all erect themselves, flattening the neck and forebody ventrovertebrally. This

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flattening process involves a much greater length of the forebody, than is seen in the cobra and I have seen the whole body flattened to the vent. In the cobra the degree to which it is manifested laterally is far greater than is seen in any of the keelbacks and their allies. During this erection, and flattening of the forebody, *stolatus* distends itself by deep drawn inspirations bringing into view those beautiful ornamentations of blue, or vermilion as the case may be to which I have referred in dealing with its colour and varieties. This behaviour is never anything more than a demonstration of alarm, possibly a menace, the snake looking as if it intended mischief, but though I have irritated it as much as I knew how I never had one attempt to bite me.

Haunts.—Its choice of a home of course depends upon its food, but though this consists of frogs and toads I cannot recall ever having met with one actually in the water in marshland, pond or jheel, moat, canal, or rivers. The reason is obvious for during the season when it is in evidence—the rains—the whole country is wet enough to make frogs abundant everywhere, and even when the land is drying, or dry short of drought many species of frogs that do not congregate in collections of water are in hiding, and toads too. I know full well that in captivity water is essential to its well-being, and I have had specimens that were to be seen at times more or less immersed in their basins. Ferguson* says :—"In captivity it is fond of lying in water" and Mr. E. E. Green in a letter to me writes : "it submerges itself in its bath at rare intervals, and remains there for many hours." Nicholson† remarks that "in dry weather the offer of a drink will at once gain their hearts." Though it is not the swimmer, or hydrophile that *piscator* is, it is frequently to be met with in damp situations, such as drying paddy fields, and the banks of canals, and Mr. Millard remarks that in October near Bombay "it is exceedingly common in the rice fields, where one sees them constantly, probably attracted by the crop of young frogs."

During the rains the buffstriped keelback distributes itself broadcast all over the land, and will be found in grassy, and cultivated

* Bombay Natural History Journal, Vol. X, p. 72.

† Indian Snakes, p. 134.

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areas of open country, but does not favour arid plains, nor jungle tracts. It is commonly to be met with in gardens, grass farms, golf-links, and similar situations about cantonments, and further afield in "khets" or any waste ground that has some sparse cover, and might harbour frogs.

It sometimes wanders into out-houses and bungalows, and especially in such of the latter where pot plants are available. In Rangoon once I had as many as four sent to me in one morning by a neighbour who flushed them in his verandah whilst re-arranging his ferns, &c.

The crepuscular gloom beneath the foliage of closely congregated pot plants, and the humidity derived from daily watering furnishes an ideal environment for mosquitoes, and other insects upon which frogs subsist, and there are always some pots with a chip out of their basal rims large enough to act as doorways to cosy quarters—from a batrachian standpoint—beneath. The same environment offers effectual concealment for the little buffstripes, and a plethora of its food supply. One of the four snakes above alluded to had swallowed a single frog, and another was replete with three inside. A specimen sent to our Society by Mr. Dwane from Madras was discovered on the horn of a living buffalo, a very curious situation for any snake.

Habits.—The buffstriped keelback is essentially diurnal in habit. It is met with abroad at any hour of the day, but is not usually encountered at night, though its relative *piscator* is frequently on the move under cover of darkness.

Though agile and active its movements are not really rapid. It always appears to me that its progression is much smoother than that exhibited by many snakes. When not roaming about the country, it often secretes itself in holes in the ground, or takes refuge in the masonry of drains, culverts, wells, out-houses, and such situations. I have sometimes detected one with its head issuing from a hole in the ground, but the slightest movement on my part caused a sudden retraction below the surface, followed after a few minutes by its re-appearance, when if satisfied that the coast was clear it emerged, and glided off.

This snake evinces a very marked disposition to æstivate,

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disappearing for some months during the drought of a hot weather, to re-appear with the first heavy rains that announce the inauguration of the monsoon. This fact has evidently been noted by the observant native hence the names "wana kukroo," "wanna pam," and "wanna cogli." Only recently too (February) Mr. Millard tells me he has offered rewards for them in Bombay but the natives say they cannot guarantee getting them except in the rains when they are plentiful.

In Rangoon, Evans and I got no single example in 1900 before the 30th of April—the day the rains broke,—but from the 2nd of May to the 2nd of August no fewer than 21 specimens were brought in. Similarly in Cannanore in 1904, during the drought between the 1st of January and the 18th of March I got only 1 specimen out of a total of 60, but from the 19th March to the 4th June between which dates a few desultory showers fell there were 3 out of 71 snakes collected, and from the 5th June—the day the big monsoon burst—to the end of July out of 81 specimens, no fewer than 38 were *stolatus*. In Fyzabad in 1906 during the drought between the 1st of January and the 18th of June—the day the rains broke—I had received a solitary specimen, but after this I obtained 6 out of 21 specimens in June, and no fewer than 87 in July and August out of a total of 485 snakes of all kinds.

In Northern India it disappears during the cold months of the year, hibernating beneath the soil. In December 1904 several were unearthed by the sepoys of the 62nd Punjabis when out in camp near Rae Bareilly in December. They were found singly at a depth of from 9 to 18 inches below the surface, chiefly in the roots of clumps of giant grass, and when dislodged were dull, and inactive. I have never known it climb into bushes, trees, or habitations, though I have seen it in masonry crevices a yard above the ground, and one was found at Chakdara basking in a chink of rock at about the same elevation.

It is very curious studying my notes that so very few hatchlings and young specimens are brought to me. Why nearly every specimen should be mature or nearly so I cannot suggest an explanation for.

Food.—Its diet is almost entirely batrachian in character, and

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whilst some show a decided partiality towards frogs, others find toads more attractive. In India it is usually the frogs *Rana cyanophlyctis*, or the young of *R. tigrina* that form its principle sustenance, these being perhaps the commonest frogs to be met with. For the same reason young toads of the species *Bufo melanostictus* are most frequently devoured. I have known *R. breviceps*, and *Microhyla ornata* taken in Fyzabad, and *Oxyglossus laevis*, and a species of *Rhacophorus* probably *leucomystax* in Burma. On several occasions I have found toads ingested, once a young *Bufo andersoni* in Fyzabad having proved the victim. I once found a gecko in a young specimen in Assam, but have never heard of a lizard being taken except on this occasion, and never a mammal. Usually a single frog, or toad satisfies its appetite, but I have more than once found as many as three in the stomach.

Colonel G. H. Evans, whose attention was once arrested by pitiful wails, found on investigation a frog in the jaws of a *stolatus*. It had been seized "a posteriori," and the snake when discovered made tracks without releasing its captive and succeeded in reaching a crevice in the ground some thirty yards away, down which it managed to insinuate itself by some lateral manœuvre head last still retaining hold of the frog. It was dug out, and froggie when released hopped away. Mr. Millard, who has known this species in captivity for over twenty years, tells me that they feed greedily on frogs, in fact he "cannot remember ever having seen it feed on anything else." On the other hand Mr. E. E. Green, who has a very intimate knowledge of the species in Ceylon, tells me that in captivity "it will look at nothing but the toad *Bufo melanostictus*," and he relates how on one occasion two *stolatus* seized the same toad in his vivarium, each proceeding to swallow from opposite points of seizure, till their noses met, when the larger snake began to engulf the smaller, but at this stage of the proceedings he interfered. In the Madras Museum * one buffstriped keelback ate 131 toads in the year, another 130, and a third 91 green frogs. Murray † says that in Sind like *piscator* it lives in pools, and feeds on fish. If this is a fact, its habits in that locality are different from those manifested in other parts of India.

* Administration Report 1896-7. † Vert. Zool. Sind, p. 380.

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The Sexes.—It is remarkable that though the sexes are very evenly balanced in many parts of India, in some localities, notably Assam, there is a great disparity in favour of the ♀. Thus out of 37 specimens sexed in Cannanore 20 were ♂ and 17 ♀, and out of 118 sexed in Fyzabad 57 were ♂ and 61 ♀. In Assam—Hills and Plains—females are more than twice as numerous, for out of 89 specimens sexed in Dibrugarh 62 were ♀, and in Shillong in the Khasi Hills no fewer than 16 out of 21 specimens proved to be this sex. In a clutch of 5 eggs brought to me in Dibrugarh there were 4 ♀♀ and one ♂. The ♀ is usually at all times longer than the ♂. Starting from the egg it frequently has a slight advantage, it more than maintains this as growth advances, and finally attains proportions considerably in excess of the ♂ as already mentioned under dimensions *q. v.*

The relative proportions of the body and tail are subject to slight variation in individuals of both sexes, but I can discover no disproportion of sexual import.

The scent glands in both sexes furnish a greenish-yellow secretion of the consistency of custard.

The ♂ claspers are beset with numerous horny, claw-like, curved processes, which must function as anchors. The nearly allied species the "grass snake" so common in England *(T. natrix)*, I have more than once encountered "in copula." When disturbed instead of detaching themselves, the larger and more powerful ♀ made for the nearest cover dragging her partner unceremoniously behind.

It seems as if these processes which are recurved so as to oppose any traction efforts serve to maintain attachment during such an emergency. Their development is such, and they are so numerous that they must provide a very firm grip, during a turgid state of the organ, and I can well imagine that if under inordinate strain the parties were pulled asunder the female parts would sustain severe laceration.

Breeding season.—It is a curious fact that though this snake goes into retirement during the hot months in the Plains, this appears to be the season when matrimonial intercourse is for the most part indulged in. This is evidently so in many cases judging from

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what we know of the period elapsing between coitus, and the deposition of eggs. The sexes must therefore in many instances retire in pairs, for when the rains burst, and the species reappear, many if not most of the females are already impregnated, and often to an advanced degree.

In Cannanore in 1904 a few showers at intervals of several days fell between the 18th March and 18th May, and frequent showers between the 20th May and 4th June. On the 5th June the monsoon burst, and *stolatus* up to this time a rarity, became abundant. I obtained a gravid ♀ in May, and 4 in June. In Fyzabad in 1906 the rains broke on the 18th June, when *stolatus* up to this date hardly in evidence became numerous. I got one gravid ♀ in June, nineteen in July, and four in August. In Rangoon in 1900 the rains broke on April 30th up to which date I had no specimen of *stolatus*. On the 30th May I got a ♀ with 8 eggs in an advanced stage of development. I have never had the good fortune to meet with a pair in conjunction, and have only had them rarely reported so. In Cannanore a pair was reported "in copula" on the 24th May, and two pairs similarly reported on the 18th June.

In Burma Theobald * reported an egg-bound ♀—precise locality not specified—in May, and Nicholson† a similar specimen in Rangoon in the same month. Evans and I had gravid ♀ ♀ in Rangoon twice in May, twice in June, twice in July, and once in October.

In Cannanore I had one egg-bound ♀ in May, four in June and four in July.

In Fyzabad I had one gravid ♀ in June, nineteen in July, and seven in August.

Nicholson† reported an egg-bound ♀ in Bangalore in August.

In Dibrugarh I had twelve gravid in April, thirteen in May, two in June, and one in July. In Shillong three specimens in an advanced stage of impregnation were brought to me in August.

A specimen from Hakgalla, Ceylon (4,600 feet) was egg-bound in September.

Period of gestation.—This is not exactly known, but it is probable that it will prove to be of the same duration as in the che-

* Cat. Rept. Brit. Burma, page 47. † Ind. Snakes, page 127.

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quered keelback *piscator*, *viz.*, about two months. A specimen of mine in Cannanore captured on the 21st June laid five eggs on the 29th July. As the specimen was obviously gravid when caught gestation must considerably exceed five weeks. A specimen in captivity in the Madras Museum whose date of capture was unfortunately not recorded, laid the first of fourteen eggs on the 17th August. As it was noted that the specimen sloughed on the 28th June, at least seven weeks elapsed before the discharge of this egg. The ♀ at full term retires to any convenient refuge in the ground, and there deposits her eggs some few inches below the surface. Unlike some other snakes she does not appear to be attended by her consort at or subsequent to this eventful period. I have only once known a ♂ in company with a ♀ after impregnation. This was in Fyzabad in July. The two snakes were described as confronting one another with reared bodies, and they remained actively engaged in this manner for some minutes. Both were killed, and I sexed them, and found the ♀ in an advanced state of impregnation. It is impossible to know whether this was a chance encounter which seems probable or whether their behaviour was of an amorous, or hostile character.

Oviposition.—In Rangoon I had a specimen that laid eggs in August. In Cannanore a ♀ deposited her eggs on the 29th July, and another laid eggs in August. In Fyzabad a ♀ deposited eggs in August. The Madras specimen already referred to oviposited in August and September.

I have frequently had eggs in clutches brought to me unearthed after deposition under natural conditions. In Rangoon once in June, in Dibrugarh several in May (once as early as the 1st) and June, and in Shillong once in August.

The full complement of eggs is discharged normally within a few hours, but some specimens in captivity have discharged them fitfully at intervals. A specimen I captured in Fyzabad on the 7th July laid one egg that night, and discharged ten more on the night of the 12th of the same month. A specimen in the Madras Museum* laid fourteen eggs as follows:—August—one on the 19th, one on the 20th, two on the 22nd; September—three on the 12th,

*Admin. Report, Madras Museum, 1896 to 1897.

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three on the 14th, one on the 15th, and three on the 18th—occupying a full month in the accomplishment of this function.

Snakes are credited with the power to retain their ova, or fœtus when circumstances are unfavorable for their deposition, but of course they cannot do so indefinitely. An unsuitable environment such as is likely to occur under captivity may explain the spasmodic discharge of the eggs in the above instances, but even in the vivarium the ♀ usually deposits her full complement within a few hours.

Eggs.—Inside the parent the ova lie in a single string like the beads of a necklace, their long axes disposed in the length of the body. They do not overlap one another nor lie transversely as is the case with their more prolific relative *piscator*. In their later stages owing to pressure within a contracted space, their poles are strongly flattened against one another, but no suggestion of this flattening is seen after they are discharged.

Immediately after expulsion the egg investment is moist and sticky so that many or all the eggs become firmly adherent to one another to form a cluster. They are pure white in colour, and the ovicular investment pliant like white kid. They are soft to the touch and their tension rather firmer than that of a grape. The poles are equally domed, and the eggs measure from $\frac{7}{8}$ to $1\frac{3}{8}$ inches in length, and $\frac{5}{8}$ to $\frac{3}{4}$ of an inch in breadth. Eggs in the same clutch always vary somewhat in their dimensions, but what one lacks in length is usually compensated for in girth. They sink in water.

When freshly oviposited they contain a custard-like material in which no trace of the developing embryo can be discerned.

It is extremely difficult to place eggs artificially under conditions favorable to their incubation. One of two things usually happens, either they shrivel up or become mouldy within a few hours, according as to whether their environment is too dry, or too wet. It is certain that they require a humid atmosphere, and I believe a light approaching twilight if not darker. After many unsuccessful attempts at incubation I find the best way to treat them is to put them on fresh earth every day under an inverted flower pot. I turn up earth in the morning to a depth depending on the humidity of the soil, and select that which is slightly damp, and

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put this to a depth of three or four inches in a gumlah and the eggs on the top. The inverted pot gives them the darkness I think essential, and then the gumlah is placed in a shady place. The following morning the earth will be found already too dry, and if not changed the eggs shrivel very rapidly.

Prolificity.—*Stolatus* is not very prolific as snakes go. I have over 70 records of eggbound ♀ ♀, and clutches of eggs that have been laid, and find that it may lay from 1 to 14 eggs, but from 5 to 10 is the usual number.

Incubation.—The parent having laid her eggs remains with them for some time, perhaps even till they hatch. During hoeing operations on the tea estates around Dibrugarh, on several occasions a ♀ was unearthed, and brought to me with her eggs. Frequently eggs were brought without the ♀, but with the report that a snake had been seen with them. On one occasion eggs brought with the attendant parent were found to contain embryos 2¼ to 3 inches long. As there is no trace of an embryo when the eggs are first deposited, this implies that for at least more than half the full period of incubation this ♀ was in attendance.

It seems certain that the parent is not unremitting in her attentions, for on several occasions when eggs were unearthed the cooly upon interrogation denied that there was any snake with them.

Period of incubation.—This almost certainly depends upon temperature, and should therefore be more protracted in the Hills than in the Plains.

In Rangoon a ♀ laid 9 eggs on the 11th of August which hatched a month later, *viz.*, one on the 10th and six on the 11th of September. The remaining eggs were non-fertile. I feel certain from other observations, and the conditions under which these eggs were placed that the incubating period was artificially abbreviated. They were laid on damp cotton wool inside a wide mouthed stoppered bottle, and placed within a couple of yards or so of an earthenware basin containing live embers. These fire receptacles are in ordinary use in Burma in the rains, and are placed beneath a wicker cage on which one's clothes are placed to dry. Though the bottle was stood outside the cage, it must have derived considerable heat from the contained embers.

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In Dibrugarh where the climate and temperature is much the same as Burma, I had eggs brought to me on the 21st May containing embryos $4\frac{3}{8}$ inches in length, but they did not hatch out till the 10th of June when they measured 6 and $6\frac{3}{8}$ inches, respectively. In this case the embryos grew about two inches in 21 days, or about one-third the length they attain to within the egg. Allowing a similar rate of growth for the whole of intraoval life the embryos would have been about 40 days acquiring a length of $4\frac{3}{8}$ inches, and the whole period would therefore exceed 60 days. Again in Shillong on the 8th of August I had eggs brought to me which contained embryos. 25 days later, *viz.*, on the 2nd of September, I extracted an embryo measuring $3\frac{1}{4}$ inches, or about half the length of a hatchling. If we allow 10 days for development sufficient to recognise the embryos as such, which is not excessive, we have about two months elapsing from the deposition of the egg to the full growth of the embryo in this case also.

Hatching.—The embryos liberate themselves from the egg by means of an osseous structure which is specially developed for this purpose, and is very soon—a day or two—shed after its function has been fulfilled. This is called the fœtal tooth or egg tooth, and is developed in the premaxillary bone. Unlike the ordinary teeth which are already developed at this stage of life it is flattened, and its cutting edge lies horizontally, projecting forward beneath the arch in the front of the mouth which is formed to admit of the protrusion of the tongue when the jaws are closed.

With this instrument the embryo makes one, or many incisions which penetrate the egg shell, but even when it has established an adequate means of exit, the little snake seems loathe to abandon its cradle, for it sometimes wholly withdraws itself within the shell after having almost vacated it, and often after lying with its head and forebody emerging, many hours elapse before it finally disengages itself, and effects its entry into the world.

In Rangoon I had one lot of embryos hatching out on the 1st and 3rd of August, another on the 10th and 11th of September, and on a third occasion on the 22nd of October (not November as previously reported in this Journal, Vol. XIII, p. 351). In Dibrugarh I had embryos hatching on the 10th of June, and others on

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the 5th and 6th July. In Cannanore I had a hatchling $6\frac{1}{4}$ inches long on the 21st November, one in Dehra Dun $5\frac{7}{8}$ inches long on the 8th of October, one in Bangalore $7\frac{1}{2}$ inches on the 29th of September, two in Fyzabad measuring $5\frac{3}{4}$ and $6\frac{1}{4}$ inches in October and two measuring $5\frac{7}{8}$ and $7\frac{1}{4}$ inches in November.

At the time of hatching the ♂ has the genitals ensheathed, and concealed from view, but I have had an embryo of $6\frac{1}{4}$ inches length in which they were extruded, showing that it is only at a very late stage of embryonic development that their invagination occurs.

When the hatchling first leaves the egg it may, or may not have part of the yolk sac adhering to the navel. This orifice, or the recently obliterated remains of it, is very apparent in the hatchling, and remains so for some months, but eventually becomes completely effaced. At exovation from 14 to 18 ventral shields intervene between it, and the anal shield, and the scar itself involves two or even three ventrals.

Growth.—When the hatchling vacates the egg it is from $5\frac{1}{4}$ to 7 inches in length, and there is little difference in the length of the sexes for in one brood two ♂ ♂ were 6, and $6\frac{7}{8}$, and two ♀ ♀ $6\frac{3}{4}$, and 7 inches respectively. In another brood one ♂ was $5\frac{7}{32}$, and four ♀ ♀ $5\frac{5}{16}$, $5\frac{3}{8}$, $5\frac{1}{2}$, and $5\frac{14}{16}$ inches, respectively. In a third case a ♂ was $6\frac{1}{4}$, and a ♀ of the same clutch $6\frac{1}{8}$ inches. It is curious this being the case that all through my notes the average measurements of the ♀ in each month appreciably exceed those of the ♂, and this becomes increasingly apparent till by the end of the 2nd year there is a disparity of two inches or more in favour of the ♀. As far as can judge the young add from 5 to 8 inches to their length in each of the first and second years, which means that they approximately double their length in the first year and have trebled it by the end of the second, by which time they have attained maturity, and any further increase in length is small and slow. The smallest gravid ♀ I have had was 1 foot $5\frac{1}{2}$ inches, but many have been from 1 foot 6 inches to 1 foot 7 inches, all lengths attained at the end of the second year. It is evident therefore from my numerous records that the majority of individuals mate at this early age. It is interesting to note from the measurements of hatchlings given above, all of which were from Dibrugarh, how close the

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measurements of individuals in the same brood run, whilst there is an appreciable difference in the average length of members of different broods.

Sloughing,—We know very little about this function, and although many snakes are kept in captivity in various institutions in India very little attention is paid to this curious habit, and seemingly no records kept. Similarly in Regent's Park, London, I failed to get any information.

A specimen I had in Rangoon sloughed on the 27th June, and again on the 24th July. Another cast its skin on the 7th and 25th of May, and again on the 23rd June in Rangoon. Some excellent records were kept some years ago in the Madras Museum,* from which I find that one specimen desquamated on the 29th June, 21st October, 22nd December 1896, and 25th January 1897. Another exfoliated on the 28th June, 6th July, 27th July, 3rd September, 14th December 1896, and on the 18th January, and 27th February 1897. This was the same specimen that laid 14 eggs, between the 17th August and 18th September. In another specimen ecdysis occurred on 17th March, 17th September, 26th December 1896, and 20th March 1897. It is very difficult to explain why in one instance four months elapsed, and in another six months, during the same period of the year in which a third specimen desquamated from every 3 to 5 weeks. All the specimens, judging from the consumption of frogs which I have quoted under food, appeared to have been in vigorous health, all the records were made in the same year, and we may assume that all the specimens were caged under similar conditions. It seems unlikely too that when special attention was being given to this function any of the occasions should have been overlooked.

Foes.—Doubtless so harmless, and diminutive a reptile frequently provides food for predaceous animals and birds. Evans and I once knew it fall a victim to the snake *Xenopeltis unicolor*, and I found one inside a banded krait *(Bungarus fasciatus)* in Dibrugarh. Mr. Primrose† in our journal has recorded one being swallowed by the green tree snake *(Dryophis mycterizans)*.

Parasites.—The buff striped keelback harbours many Entozoa.

* Administration Report 1896. † Vol. XV., p. 347.

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One of these is a maggot-like creature which I have figured in a recent issue of this Journal* and is called *Porocephalus crotali*. It is whitish in colour, about ¾ of an inch long, and attaches itself to the tissues about the entrails of the snake, but is not found in the intestine, or solid organs. Several are to be found in the same snake, but always solitary. The head, which is its thickest part, is furnished on its lower aspect with four curved claw-like hooks, yellowish in colour, and placed around the mouth. By these it attaches itself to the mesenteric folds. The body which gradually reduces in girth posteriorly, consists of several subequal segments. It no doubt sucks the blood of its host.

Another parasite, and one which must seriously affect the health of its host is a nematode worm called *Kalicephalus willeyi* after Dr. Willey, the Director of the Colombo Museum (*see* Plate figures G. H. I.) This I have only found in the stomach, attaching itself to the inner coats of that organ, but Von Linstow says it also inhabits the intestine of many snakes. It is of a gregarious habit, and the several members of a single colony vary very much in length, the longest being as much as 5 inches. It is about as thick throughout as the catgut on a tennis racquet, reddish-brown in colour, with a greyish-white caudal extremity. The head as shown by Von Linstow is compressed, and is furrowed dorsally, and ventrally. The mouth is large, and has six papillæ, three on each side situated around its margin. The body appears to be depressed, and its surface smooth. Often more than one cluster of these worms is found to have invaded the stomach. This organ as a result of these parasites becomes knuckled and distorted, and its walls very much thickened, cartilaginous, and rigid, so that it would appear doubtful if it could distend sufficiently to accommodate the relatively enormous bulk that is so often swallowed at a meal.

This worm appears to infest many snakes, for it has been reported from the stomach and gullet of Russell's viper (*Vipera russelli*, from the intestine of *Coluber helena* and from *Typhlops braminus*) by Von Linstow,† and I have found it in the stomachs

Vol. XIX, p. 837.

† Spol. Zeylan. Vol. I, p. 99, and Vol. III, p. 163.

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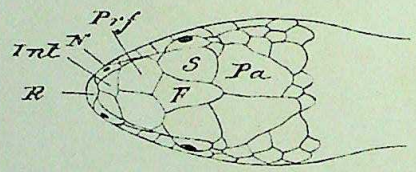
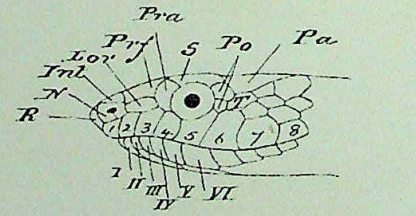
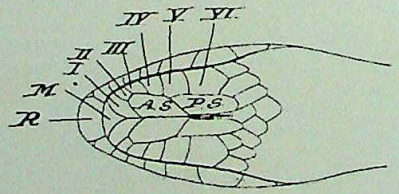
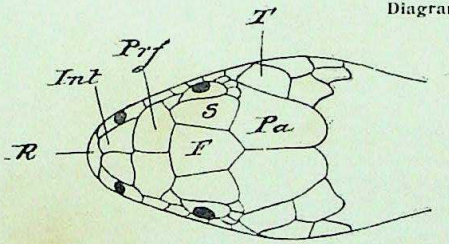
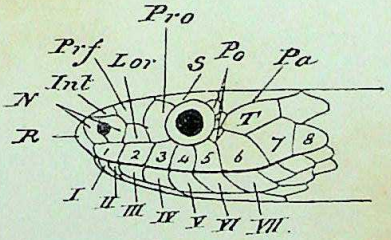


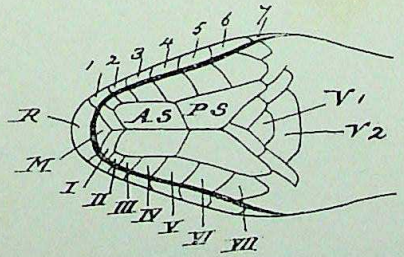




Psammophis condanarus.
(Nat. size.)







Tropidonotus stolatus.
(× 2)

COMMON INDIAN SNAKES. (WALL)

A. B. C. Head Shields of *Psammophis condanarus.* **D. E. F.** Head Shields of *Tropidonotus stolatus.*

A. S. Anterior Sublinguals. *F.* Frontal. *Int.* Internasal. *Lor.* Loreal. *M* Mental. *N.* Nasals. *Pa.* Parietal. *Po.* Postoculars. *Pro.* Praeocularis. *Prf.* Prefrontals. *P. S.* Posterior Sublinguals. *R.* Rostral. *S.* Supraocular. *T.* Temporal. *1 to 8.* Supralabials. *I* to *VII.* Infralabials. *V 1 & V 2* 1st and 2nd Ventrals.

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of the banded krait (*Bungarus fasciatus*), and *Tropidonotus piscator* as well as in *T. stolatus*. Von Linstow further states that it occurs in snakes inhabiting South America. A third parasite infesting *stolatus* is a larval form of tapeworm, which though sent to Professor Von Linstow he could not further determine than that it was a species of *Pterocereus*. These parasites are white, and flattened, and locate themselves usually beneath the lining membrane of the abdominal cavity, but sometimes beneath the dorsal integument, where they form flat blister-like swellings. When these are cut into, the parasite is found in a convoluted mass which, when unravelled may measure up to 10 inches in length. They do not seem to invade any hollow or solid organ. They exist in large numbers in some specimens even to the extent of making the host appear gravid. I have found this worm also around the intestine in *Bungarus fasciatus*, beneath the peritoneum of *Tropidonotus piscator*, and beneath the skin of *Coluber radiatus* as well as in *T. stolatus*.

Local Distribution.—This species is a resident in the Plains, but wanders to an altitude in the Hills which varies with the locality. Its relative abundance in various districts in the Plains, and the altitude to which it wanders is interesting. In the low country in Ceylon Dr. Willey* reports it the commonest snake to be met with. Mr. E. E. Green tells me that in Kandy (1,700 feet) it is quite common, and Mr. Pearless† says that at Badulla (2,500 feet) it is very common, but at Hakgalla (5,600 feet) I only got one specimen out of 80 collected.

In Cannanore out of 377 snakes collected, 2 in every 13 were of this species, but at Paralai in the Anamallays (3,500 to 4,000 feet) I got no specimen out of 91 sent me in 1909. I am told, however, by the Revd. E. M. Gombert, S. J., that it is common in the Palney Hills (Shembaganur) between 5,000 to 6,000 feet.

In Fyzabad out of 704 snakes, 2 in every 9 were *stolatus*, but in the Western Himalayas at Almora (5,300 feet) I got only 2 in 38 snakes of all kinds in 1909. In the Bengal Plains it is evidently very common, for I got 7 specimens out of 25 sent me from the Jalpaiguri District, but out of a collection of 778 made in the

* Spol. Zeylan., April 1906, p. 233. † Spol. Zeylan. March 1909.

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Eastern Himalayas below Darjeeling (1,500 to 7,000 feet) only one *stolatus* came to bag, this being found below 2,800 feet. The difference in the altitude to which it wanders in this, compared with the Western part of the same mountain range, is certainly noteworthy.

In the Plains of Assam out of 615 snakes collected 1 in every 4 was a *stolatus*, and in the Khasi Hills at Shillong (4,900 feet), it was nearly as common, for among 264 snakes collected 1 in every 7 was this species.

In Lower Burma out of 615 snakes mostly collected about Rangoon 1 in every 15 was a *stolatus*. I have had a specimen from Haka in the Chin Hills (6,500 feet).

Geographical distribution.—The whole of Southern Continental Asia from Sind in the West to China in the East. It also occurs in the Island of Ceylon, probably the Andamans, though I can find no record from this group, the Nicobars, Hainan, Hongkong, Formosa, and the Philippines.

Lepidosis.—Rostral.—Touches 6 shields, the rostronasal sutures being about twice as long as the rest. *Internasals*—Two, the suture between them being nearly as long as that between the præfrontal fellows, and subequal to the internaso-præfrontal sutures. *Præfrontals*—Two, the suture between them subequal or rather greater than the præfronto-frontal sutures; in contact with the internasal, postnasal, loreal, præocular, supraocular and frontal. *Frontal*—Touches 6 shields, the fronto-supraocular sutures being twice or more than twice the fronto-parietals. *Supraoculars*—About as long, but not so broad as the frontal along a line connecting the centres of the eyes. *Nasals*—Divided; in contact with the 1st only of the supralabial series. *Loreal*—One, about as deep as long. *Præocular*—One. *Postoculars*—Three usually, not infrequently four. *Temporals*—One, touching the 6th and 7th supralabials. *Supralabials*—7 with the 3rd and 4th touching the eye, or 8 with the 5th also touching the eye. *Infralabials*—7, the 7th usually touching 3 scales behind; 5th, 6th and 7th usually touching the posterior sublinguals. *Sublinguals*—Two pairs, the posterior rather longer, and separated by 1 + 2, or 1 + 1 + 2 small scales succeeded by the 1st narrow ventral.

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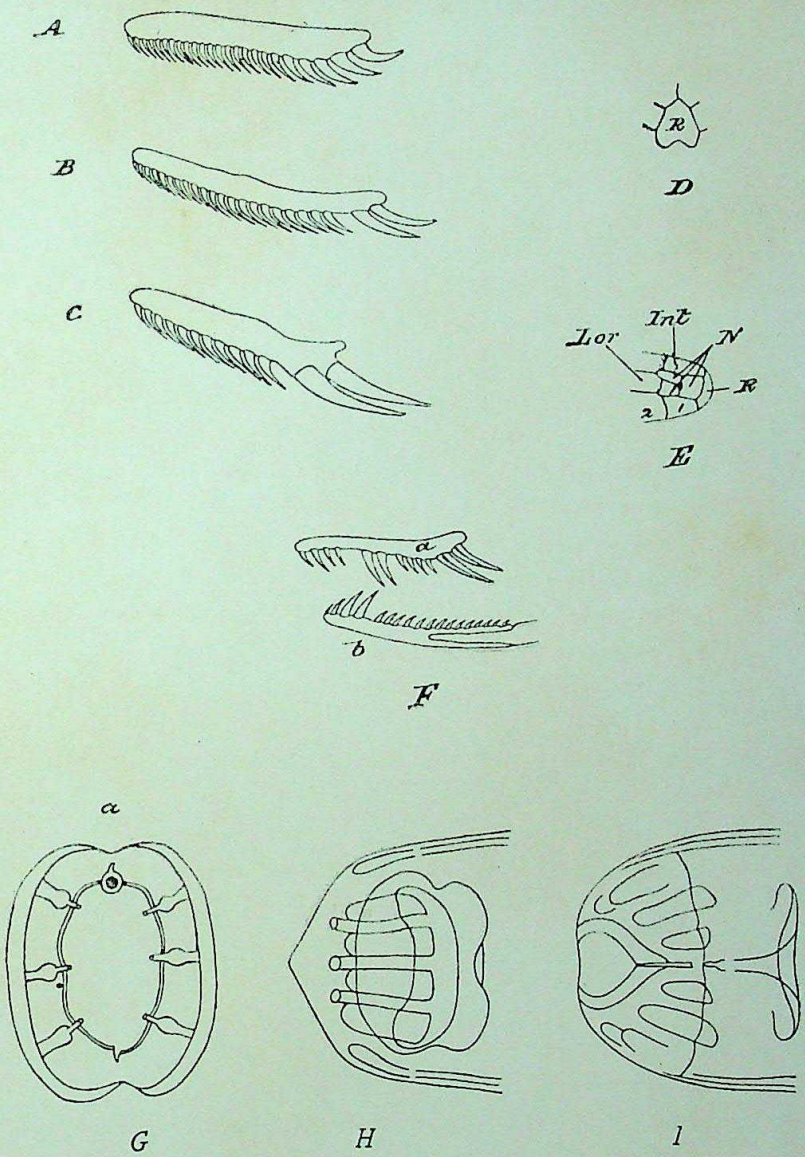

Kalicephalus willeyi (much enlarged).
(After Von Linstow.)

COMMON INDIAN SNAKES. (WALL.)

A. Maxilla of *Tropidonotus natrix*. *B.* Maxilla of *Tropidonotus stolatus*. *C.* Maxilla of *Macropistodon plumbicolor*. *D.* To show rostral from in front *P. condanarus*. *E.* To show the nasals of *Psammophis longifrons*. *F.* Dentition of *Psammophis condanarus*—(*a*) Maxilla, (*b*) Mandible. *G.* Mouth seen in front (*a*) dorsum. *H.* Profile view of head. *I.* Dorsal view of head.

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Costals—Two headslengths behind the head 19, midbody 19, two headslengths before the vent 17. The rows diminish by a fusion of the 3rd and 4th rows above the ventrals at a point shortly behind midbody. Keels present and strong in all but the last row usually, which may or may not have faint keels posteriorly. Apical facets present in pairs, but often obscure. *Ventrals*—Evenly rounded from side to side, 136 to 154 (120 to 161 Boulenger). *Anal*—Divided. *Subcaudals*—In pairs, 46 to 86 (89 Boulenger).

Anomalies.—The supralabials and infralabials are subject to frequent variation due to a confluence of shields, usually seen on one side, but sometimes on both. Thus I have seen 6 supralabials on one side in four specimens, the 2nd and 3rd touched the eye in one, the 3rd only in two and the 3rd and 4th in one. I have found 7 supralabials on one side twice of which the 4th alone touched the eye. In thirteen specimens I have found 8 with the 4th and 5th only touching the eye, in four of these on both sides. I once found 9 on one side of which the 4th, 5th and 6th touched the eye. With the infralabials it is not infrequently that one sees but 4 touching the anterior sublinguals instead of the normal 5. On 7 occasions I have seen a double loreal on both sides, one superposed above the other, one specimen was from Rangoon, one from Shillong, two from Trivandrum, and three from Dibrugarh. I have found two anterior temporals on one side in three specimens, and once this shield was confluent with the two supralabials below. In one specimen I have seen two præoculars, and in one other only two postoculars. In three cases I have seen the 2nd supralabial on one side slightly in contact with the nasal shield. I have once seen three pairs of sublinguals, the normal anterior pair being divided.

Dentition.—Maxillary.—22 subequal teeth, separated by a gap behind—that would accommodate a similar tooth—from two subequal, enlarged, and compressed teeth placed one behind the other which are fully twice as long as any of the preceding. *Palatine*—16 or 17, small, and subequal. *Pterygoid*—31 decreasing in length gradually behind. *Mandibular*—31 to 32, subequal except behind where they gradually diminish in size.

Our PLATE is disappointing in its colouring. The striping is

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everywhere rather too well defined, and the light stripes should be buff, and not greyish-blue. The underparts shown in figs. 8 and 9 are misleading, as the colour should be pale yellow or pearly white.

The expression, and general form is very faithfully depicted.

Opisthoglyphous colubrines, or snakes which have grooved teeth placed in the back of the maxilla ("opisthe" behind, and "glypho" I carve) are divided into three sub-families : (1) *Homalopsinæ*, (2) *Dipsadomorphinæ*, and (3) *Elachistodontinæ*.

Psammophis is one of the 69 genera into which the second sub-family is divided, and includes 17 species. The genus is principally African, no fewer than 13 species being peculiar to that Continent.

Of the 4 species that are known from Indian limits one, *viz.*, *schokari* extends from North Africa into South-West Asia (Arabia to Sind), one, *viz.*, *leithi* is strictly speaking Holarctic, but just extends within Tropical limits (United Provinces), the remaining two, *viz.*, *longifrons* and *condanarus* are Tropical, the former exclusively so, but the latter extends into the Holarctic area (Western Himalayas, Sind, etc).

PSAMMOPHIS CONDANARUS (MERREM).

The Indo-Burmese Sandsnake.

Nomenclature—(*a*) *Scientific.*—The generic name was introduced by Boie in 1827 and is from the Greek "psammos" sand, and "ophis" snake. The specific name is a latinised version of "condanarouse" the vernacular name by which it is known according to Russell in Ganjam District.

(*b*) *English.*—I think the best name for it is the Indo-Burmese Sandsnake.

(*c*) *Vernacular.*—The only name I know of is that mentioned by Russell above, the meaning of which I have failed to obtain any information upon.

General characters.—It is a graceful snake of rather slender habit. The head is a longish oval with a rounded and somewhat narrow and short snout. The ridge from the eye above the lore is

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prominent and the lore grooved horizontally. The nostril is rather small with a cleft proceeding downwards to the 1st supralabial. The eye is moderately small with a round pupil, and a brown iris sometimes edged along its pupillary border with gold. The tongue is red tipped with black. The body is rather slender, smooth and rounded in contour, it attenuates slightly in front to indicate the neck and very gradually behind, where it passes insensibly into the tail, which is unusually long being rather less than one-quarter to one-fifth the entire length of the snake.

Colour and markings.—The dorsum is marked longitudinally with well defined, alternate, nut-brown, and pale greenish-olive or buff stripes, the hues in each case being subject to much variation in individuals. The median pair of light stripes begin about the frontal shield, and end at the vent. They involve the upper half of the 7th and the whole 8th rows of scales above the ventrals at midbody, but are sometimes more or less confluent in the hind body.* The lower and broader light stripes begin on the rostral shield, pass over the eyebrows down the body, to the tail tip. These involve the upper half of the 3rd, the whole 4th, and the lower half of the 5th rows above the ventrals at midbody. The upper lip is creamy-yellow or opalescent and the lower half of the last row of scales and belly are opalescent, sulphur, or primrose-yellow, uniform except for a thin black and carrot-red line (which before desquamation may be modified to blue and rose-pink) on each side of the ventrals. The skin between the scales is blackish throughout.

Dimensions.—The largest specimen I have had was a ♂ measuring 3 feet $3\frac{5}{8}$ inches in Fyzabad, but I have had three others over 3 feet. Günther† mentions one 3 feet 4 inches.

Identification.—First count the scales two headslengths behind the head, at midbody, and two headslengths before the vent, and they will be found to number 17-17-13, respectively. Besides the genus *Psammophis* only three other Indian snakes have the same number of scales, and all are easily distinguished from this

* Rarely they are absent altogether or present for a short length anteriorly.

† Rept. Brit. Ind., p. 291.

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genus by attention to the following points:—(1) *Lachesis trigonocephalus* has no enlarged plate-like shields on the head, a pit in the side of the face, strongly keeled scales, and a vertical pupil; (2) *Chrysopelea ornata* has the ventral shields keeled on each side; (3) *Gerardia prevostiana* has only 5 shields touching the rostral.

It remains now to separate *condanarus* from the other three species of *Psammophis*, and here the nasal shields will suffice.* In *condanarus* there is either a single nasal shield partially divided by a suture running from the nostril to the first labial as shown in Diagram I, figure B, or another suture above the nostril may completely divide the shield into two. In the other three species the shield is not only completely divided vertically into two parts, but the posterior part is further subdivided by a horizontal suture as shown in our Diagram (figure E).

To sum up the points to look for, and in the order here given are—

(1) Costals 17—17—13.

(2) Large plate like head shields.

(3) Rounded ventrals.

(4) Rostral touching 6 shields (see Fig. D of diagram).

(5) Posterior nasal not divided into two parts.

Haunts.—I have very rarely met with this snake myself in its natural haunts, but from enquiries made from those who have brought me specimens it appears to frequent grass land, and rather open jungle. In Fyzabad it came occasionally into the Cantonment, but was more often encountered in the little patches of tamarisk (jhow) outside Cantonment limits. Here it was frequently met with in the branches of the tamarisk shrubs showing a decided arboreal tendency. On one occasion it came into a house in the Cantonment. In Almora it is found usually in the wooded patches in and close at hand. Mr. P. W. MacKinnon, who gave me specimens, told me that it is common about

* The undivided condition of the anal will proclaim the identity of *leithi*. In *schokari* the supralabials are usually 9 with the 5th and 6th touching the eye, and the frontal touches 8 shields. In *longifrons* the frontal touches 6 shields and the supralabials are usually 8, rarely 9, with the 4th and 5th (rarely 5th and 6th) touching the eye.

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Mussoorie and in the Dun, and he once shot a serpent eagle (*Circaetus gallicus*) which he saw stoop at something in a patch of grass, and found no less than 7 snakes of this species in its crop showing how plentiful it must be in that part of the Himalayas. Theobald* says that in Burma it inhabits grass land and paddy fields. From these observations it will be seen that it is by no means a desert snake such as its name suggests.

Habits and Disposition.—Very few specimens have reached me alive, but the few I have seen and played with showed me that it is a very active snake, very much on the alert, and quick in movement. It displays much spirit, and I had to treat it with respect and caution to avoid being bitten. One specimen I had lay reclining on a branch, and when I seized it by the tail slipped off, and began a most vigorous corkscrew contortion which had the effect of snapping its tail in my fingers when it immediately made off. This crafty manœuvre is practised by other snakes and particularly by the keelbacks (*Tropidonoti*) which accounts for so many of the specimens brought in to me having imperfect tails. The fact that Jerdon† found one in the act of swallowing so truculent and dangerous a snake as the *Echis* shows that it can be both plucky and vicious. Theobald‡ remarks on the activity of the specimens he saw in Burma. It is obviously of diurnal habit judging from the information I invariably received from its captors.

Food.—I have known a frog taken once, lizards of the genus *Mabuia* twice, and *Calotes* once. Jerdon's record of a viper (*Echis*) being overpowered by this species is indeed very remarkable.

The Sexes.—Females in Fyzabad I found largely predominated over males, 16 of the former coming to bag against 6 of the latter. In Almora too last year the only specimens I got, four in number, were all females. Both sexes grow to about the same length. The male claspers I found peculiar, differing from these organs in other snakes in that when forcibly extruded by digital

* Rept. Brit. Burma, p. 43.

† Jourl., As. Soc., Bengal, xxii, p. 529.

‡ Cat. Rept., Brit. Burma, 1886, p. 43.

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pressure behind the vent they were directed downwards instead of forwards. They are thin, long, and spirally twisted reminding me of a black buck's horn. Again they are entirely lacking in asperities or tentacles such as one usually sees on these organs in other snakes. The secretion from the anal glands in both sexes is greenish-yellow.

Breeding.—I can give no precise information in this direction. We do not know yet whether the species is oviparous or viviparous. The breeding season is probably about May. I had young in August 1906 measuring respectively 1 foot 2¾ inches and 1 foot 4⅜ inches which were obviously that year's production. The smallest specimen I have ever had measured 11¾ inches from Muktesar, date not known. I believe this was a hatchling, and if so, the two young alluded to above must have probably taken three months to grow to the lengths mentioned. Further of eight adult females collected in July and August none were gravid showing that the production of the young was already past. The length of the young when entering the world is probably about a foot, and my notes make it appear that they grow about eight inches a year.

Distribution.—As will be seen from the accompanying map the distribution of this snake based on the available records up to date is decidedly peculiar.

It inhabits Peninsular India from Sind in the West to Bengal (about 86° longitude) in the East, and from Kurnool in the South to the Western Himalayas in the North. It does not appear to occur in the Eastern Himalayas, nor in the Brahmaputra Basin, nor the Irrawady Basin except near its mouth, but re-appears in the Salween Basin. Beyond this it does not extend to Indo-China nor the Malayan Peninsula.

In the Indian Plains it is common in the Ganges Basin (at least in the United Provinces) but everywhere else is a decidedly uncommon snake. It may however prove to be a commoner snake than available records would make it appear, for it was not known from the United Provinces below the Himalayas before I went to Fyzabad where I found it common. In the Western Himalayas it is one of the commonest snakes at altitudes between 3,000 and 6,000

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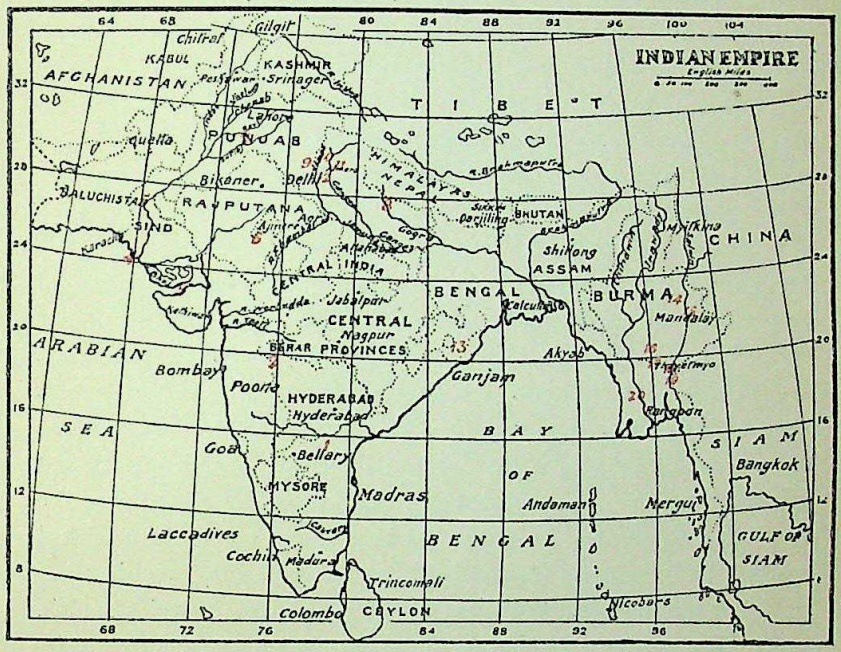

DISTRIBUTION OF *PSAMMOPHIS CONDANARUS.*

1 Kurnool (Nallamallay Hills) (Beddome). 2 Jalna (Jerdon). 3 Cutch (I. M.). 4 Kotri (B. M.). 5 Jacobabad (Murray). 6 Ajmer (Blanford). 7 Chilianwalla (B. M.). 8 Fyzabad (F. W.). 9 Hurdwar (Stoliczka). 10 Simla (Stoliczka). 11 Dehra Dun and Mussoorie (F. W.). 12 Almora and Muktesar (F. W.). 13 Ganjam (Russell). 14 Sagaing (F. W.). 15 Tounggyi (B. M. and F. W). 16 Prome (I. M., Wall and Evans). 17 Tharrawady (F. W.). 18 Pegu (B. M.). 19 Manbee (Hmawbi? Theobald). 20 Bassein (I. M.).

I. M. implies Indian Museum, and B. M. British Museum.

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feet. In Burma it is rather uncommon, Evans and I only obtaining five out of some 600 odd snakes. Two of these were from Prome, two from the Southern Shan States, and one from Sagaing.

Lepidosis—Rostral.—Touches 6 shields, the rostro nasal suture being much longer than the rostro-internasals. *Internasals.*—A pair, the suture between the fellows about two-thirds that between the præfrontal fellows, and about two-thirds to nearly equal to the internaso-præfrontal. *Præfrontals.*—A pair, the suture between them about one-third greater than the præfronto-frontal; in contact with internasal, postnasal (or nasal), loreal, præocular, supraocular, and frontal. *Frontal.*—Touches 6 shields, the fronto-supraocular suture three times the length of the fronto-parietals and twice the fronto-præfrontals. *Supraoculars.*—Length subequal to breadth; rather broader than frontal. *Nasals.*—Semi-divided or divided, in contact with the 1st and 2nd supralabials. *Loreal.*—One, about twice as long as high. *Præocular.*—One, not touching frontal. *Postoculars.*—Two. *Temporals.*—One, touching one supralabial only, normally the 6th. *Supralabials.*—Normally 8 with the 4th and 5th touching the eye, sometimes 9, the 5th and 6th touching the eye. *Infralabials.*—5 or 6, the last largest and in contact with 2 scales usually behind; 4th and 5th, or 5th and 6th touching the posterior sublinguals. *Sublinguals.*—Two subequal pairs. *Costals.*—Two headslengths behind head 17, at midbody 17, two headslengths before vent 13. The reduction from 17 to 15 is due to an absorption of the 3rd row above the ventrals, that from 15 to 13 to the absorption of the 7th row, but both steps occurring very closely together may be mixed or reversed; apical facets single, obscure; keels none. *Ventrals.*—166 to 188 (156 Boulenger) evenly rounded. *Anal.*—Divided. *Subcaudals.*—71 to 92 (64 Jerdon), from 9 to 12 ventrals intervene between the navel and anal shield.

Anomalies.—I have once seen an inferior loreal wedged between the 2nd and 3rd labials, and once the two last ventrals were divided like the anal.

Dentition—Maxillary.*—In front 4 (rarely 3) small teeth, the

* From 5 skulls from Fyzabad and Burma in my collection.

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2nd longest, then a short edentulous gap succeeded by two large ungrooved teeth fully twice as long as the preceding. Behind these is a short edentulous gap, then a series of 4 or 5 small, subequal, teeth followed by a pair of obliquely set, grooved, fang-like, teeth fully twice as long as the immediately preceding ones. *Palatine.*—7 to 10 small subequal teeth. *Pterygoid.*—13 to 16 small and subequal. *Mandibular.*—In front 2 small followed by two ungrooved teeth fully twice as long as the preceding. After a short edentulous gap 12 to 18 small subequal teeth.

PLATE.—Our coloured figures with one exception are very disappointing. Fig. 6 gives a good illustration of the buff stripes as seen in the posterior part of the body.

Figs. 1, 2, 4, and 5 do not show the beauty of the vermilion ornamentation as seen in life, this true being not only too dingy, but too inconspicuous. In fig. 4 the belly should be pearly-white and the throat a bright yellow.

Fig. 3 is intended to represent a blue variety, but the blue is not well shown. The black bars in figs. 1 and 3 are shown too regular, those of each side more usually alternate, or, are broken up often forming a chequering rather than barring.

(To be continued.)

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THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN "THE FAUNA OF BRITISH INDIA."

SERIES IV, PART I.

By

Sir George F. Hampson, Bart., F.Z.S., F.E.S.

(Continued from page 125 of this Volume.)

Hadeninæ.

Genus Trichestra.

Type.

Trichestra, Hmpsn., Cat. Lep. Phal. B. M. v., p. 8 (1905).. *arbuticolens.*

Proboscis fully developed; palpi upturned, the 2nd joint fringed with hair in front, the 3rd moderate; frons smooth; eyes large, hairy, overhung by cilia; antennæ of male typically ciliated; head and thorax clothed with hair and scales, the pro- and meta-thorax with spreading crests; tibiæ fringed with hair; abdomen with dorsal series of crests. Forewing with veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle or shortly stalked; 8 anastomosing with the cell near base only.

1691*a*. Trichestra serrata, Hmpsn., A. M. N. H. (8) iv., p. 372 (1909).

Antennæ of male strongly serrate.

♂. Head and thorax reddish-brown mixed with white and some black; palpi and frons blackish; tibiæ and tarsi blackish ringed with white; abdomen dark-brown mixed with white, whitish at sides towards base. Forewing rufous mixed with grey and irrorated with black, the terminal area greyer, the veins slightly streaked with white; subbasal line double, black, from costa to vein 1; antemedial line double filled in with whitish, oblique, waved; claviform moderate, defined by black; orbicular white defined by black, small, rounded; reniform with white annulus defined by black, somewhat angled inwards on median nervure; postmedial line black, bent outwards below costa, then dentate and with white and black points beyond it on the veins, incurved below vein 4, some white points beyond it on costa; subterminal line white, excurved below vein 7 and at middle; a terminal series of black striæ with white points between them. Hindwing white tinged with brown especially on apical area; an indistinct dark discoidal point and curved postmedial line; a terminal series of black striæ;

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cilia with a blackish line through them; the underside white, the costal area irrorated with rufous and blackish, a blackish discoidal spot, somewhat dentate postmedial line and terminal series of lunules.

Habitat.—KASHMIR, *Exp.* 26 mill.

Genus ELUSA.

	Type.
Elusa, Wlk., xvi, 202 (1858)	*ceneusalis.*
Alimala, Wlk., Journ. Linn. Soc., Zool., vi., p. 153 (1862)..	*ceneusalis.*
Seria, Wlk., Journ. Linn. Soc., Zool., vi., p. 193 (1862) ..	*cyathicornis.*
Penza, Wlk., Journ. Linn. Soc., Zool., vii., p. 56 (1864) ..	*puncticeps.*
Lugana, Moore, Lep. Atk., p. 145 (1882)	*antennata.*
Desana, Swinh., Cat. Het. Mus. Oxon. ii., p. 26 (1900) ..	*peninsulata.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching to or to above vertex of head and moderately scaled, the 3rd moderate or long, somewhat porrect; frons smooth; eyes hairy, large, round; thorax clothed with hair and scales mixed, the pro- and meta-thorax with spreading crests; tibiæ fringed with long hair; abdomen with dorsal crests on basal segments, the crests on 3rd segment large. Forewing with the apex rounded, the termen evenly curved and not crenulate, the inner margin with scale-tooth at tornus; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form a long areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 shortly stalked; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male with the basal half of shaft bipectinate with short coalesced contorted branches, the medial part of shaft with rounded vesicle formed of coalesced branches and hollowed out in front, the terminal third of shaft pectinate above minutely serrate near the vesicle below; the hind tibiæ dilated and fringed with long hair behind.

B (*Seria*). Palpi of male with the 2nd joint reaching to about vertex of head.

a. Forewing with straight whitish subterminal line defined by small dark spots on inner side.

a[1]. Forewing with the terminal half pale, the basal half blackish. .. .. *antennata.*

b[1]. Forewing uniform brown .. .. .. *cyathicornis.*

b. Forewing with subterminal series of small whitish spots with dark spots on their inner side .. .. *bipars.*

1852. ELUSA ANTENNATA.

1851. ELUSA CYATHICORNIS.

1850. ELUSA BIPARS.

1682*c*. MISELIA CONSPERSA.

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Noctua nana, Rott. Nat., ix., p. 132 (1776); nec. Hüfn. Staud. Cat. Lep. Pal., p. 162.

Noctua conspersa, Schiff. Wein. Verz., p. 71 (1776); Esp. Schmett. iv., pl. 119, f. 5; Hübn. Eur. Schmett. Noct., f. 52; Dup. Lép. Fr. vi., p. 354, pl. 95, f. 1.

Bombyx annulata, Fabr. Spec. Ins ii., p. 204 (1781).

Dianthœcia ochrea, Gregson, Ent. Rec. ii., p. 306 (1891).

Dianthœcia dealbata, Staud. Iris. v., p. 365 (1892).

Dianthœcia hethlandica, Staud. Iris. v., p. 366 (1892).

Euplexia niveifera, Hmpsn., J. Bomb. Soc. xvii., p. 469 (1906).

Head and thorax white with black markings; tegulæ and patagia edged with black, the former with black medial line; tarsi ringed with white; abdomen pale-brown. Forewing olive grey suffused in parts with black, and with white patches tinged in parts with yellow; a basal white patch on costa traversed by the double waved, subbasal line from costa to submedian fold; a double waved antemedial line traversing a white patch on inner margin; claviform defined by black with a bidentate white patch beyond it on base of vein 2 extending into the cell on outer side of the orbicular which is round, white defined by black and with some white marks above it on costa; reniform white defined by black and with olive centre; postmedial line double, lunulate, filled in with white towards costa and inner margin, bent outwards below costa, slightly incurved at discal fold, incurved below vein 4, some white points beyond it on costa and a white patch on inner area; subterminal line white defined on inner side by some dentate black marks at middle, angled outwards at vein 7 and excurved at middle, the area beyond it more or less suffused with white and with a white apical patch; a terminal series of small black lunules; cilia chequered fuscous and white. Hindwing fuscous brown, the interspaces rather paler towards base; cilia white at tips; the underside greyish thickly irrorated with fuscous, a discoidal spot and curved postmedial and subterminal bands.

ab. 1. *ochrea.* Forewing with the markings ochreous instead of white.

ab. 2. *hethlandica.* Forewing much darker, often almost uniform fuscous, the cilia without white. Shetland Islands.

ab. 3. *dealbata.* Forewing with the white markings reduced, the apical patch absent. Armenia, W. Turkistan, E. Siberia.

ab. 4. *niveifera.* Forewing with the ante and post medial areas golden olive without white on inner margin. Punjab.

Habitat.—Europe; Armenia; Asia Minor; W. Turkistan; W. Siberia; Mongolia; Tibet; E. Siberia; Punjab, Simla. *Exp.* 36 mill.

Larva. Meyr. Brit. Lep. p. 77; Barrett, Lep., Brit., iv., p. 252, pl. 164.

Pale-brownish ochreous; dorsal line pale, traversing a series of dark V-shaped marks; two pale brownish lateral lines; spiracular line whitish;

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spiracles pink; head pale-brownish with four dark streaks. Food plants: seed capsules of *Lychnis* and *Silene* 7-9.

1698*a*. MISELIA ILLOBA, Butl., A. M. N. H. (5) i., p. 162 (1878); id. Ill. Het. B. M. iii, pl. 44, f. 7; Staud Cat. Lep. Pal, p. 157; Hmpsn., Cat. Lep. Pal B. M. v., p. 151.

Graphiphora pacifica, Butl., A. M. N. H. (5) i., p. 165 (1878); id. Ill. Het. B.M. ii., pl. 30, f. 2.

Mamestra declinans, Staud. Stett. Ent. Zeit. 1888, p. 250; id. Rom. Mém. vi., p. 427, pl. 8, f. 2.

Head and thorax cupreous red; abdomen greyish tinged with rufous. Forewing cupreous red with some darker red-brown suffusion on costal area to postmedial line and in and below cell; subbasal line represented by a slight striga from costa; antemedial line indistinctly double, oblique, waved; claviform an ill-defined brown mark; orbicular and reniform with grey annuli defined by brown, the former rather oblique elliptical, open above, the latter slightly angled inwards on median nervure; an indistinct curved medial line; postmedial line fine, slightly bent outwards below costa, then waved, excurved to vein 4, then incurved; subterminal line indistinct, greyish defined on inner side by red-brown, angled outwards at vein 7 and excurved at middle; cilia brown with a fine whitish line at base. Hindwing white, the costal and terminal areas tinged with brown; a small discoidal spot; a fine brown terminal line; cilia whitish; the underside white, the costal area suffused with brown, a small discoidal spot, slight curved postmedial line on costal area and faint curved subterminal line.

Habitat.—E. SIBERIA, Ussuri; JAPAN; COREA; C. CHINA, Kikiuang; ASSAM, Khasis. *Exp.* 44 mill.

1710. MONIMA RUBIDA.

Genus PIMPRANA.

	Type.
Pimprana, Moore, Lep. Atk., p. 41 (1882) ..	..*atcinsoni*.

Proboscis fully developed; palpi obliquely upturned, fringed with long hair in front, the 3rd joint short; frons with trincate conical prominence with raised edges; eyes rather small, round; antennæ of male ciliated; head and thorax clothed with long hair only and without crests; tibiæ fringed with long hair on outer side; abdomen with some rough hair on dorsum and lateral fringes of hair, but without crests. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

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1576. PIMPRANA ATCINSONI.

Sub-family CUCULLIANÆ.

Proboscis usually well developed, sometimes aborted or absent; palpi usually short, upturned or porrect, the 3rd joint sometimes long and dilated at extremity, in *Xantholeuca* rostriform; frons sometimes with rounded prominence with corneous plate below it, or with corneous processes of various forms; eyes naked, overhung by more or less developed bristly cilia from their margins, the eyes usually large and round, sometimes small and reniform; antennæ usually ciliated, sometimes serrate or pectinated, more rarely laminate or almost simple; head and thorax clothed with hair and scales when there are usually crests on the pro- and meta-thorax or a ridge-like dorsal crest, or clothed with hair only, the tegulæ sometimes produced dorsally into a ridge, or in *Cucullia* and allied genera produced behind into a more or less developed hood over the thorax; tibiæ without spines, the fore tibia sometimes with terminal claws; the proximal joints of fore tarsi sometimes with a series of curved claw-like spines; abdomen usually with a series of dorsal crests or one crest at base. Wings usually, rather broad, but often long and narrow, the termen rounded or crenulate, rarely slightly angled at middle; forewing with vein 1*a* weak, not anastomosing with 1*b*, 1*c* absent; 2 from middle of cell; 3 and 5 from near lower angle; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell; hindwing with veins 1 *a* and *b* present, 1*c* absent; 3, 4 from lower angle of cell; 5 obsolescent from or from just below middle of discocellulars; 6·7 from upper angle or shortly stalked; 8 arising free, then bent downwards and touching the cell, then again diverging. In *Thecophora* the male has a very large boat-shaped fovea in disc of hindwing the extremity of subcostal nervure being dilated and played on by the spines of the elongate 1st joint of hind tarsus, the tibia being shortened.

The imagos mostly appear in the autumn or spring, sometimes hybernating. Larva smooth, the warts with one hair, all the prolegs present, the 12th somite with more or less developed dorsal hump, in *Cucullia artemisiæ* there are subdorsal series of double hump-like warts. The larva of *Cucullia* and allies are usually bright coloured, feeding exposed on plants.

Key to the Genera.

A. Tegulæ more or less strongly produced behind into a hood .. .. *Cucullia.*

B. Tegulæ not produced behind into a hood.

a. Frons with trincate corneous prominence with raised edges and trilobate process from lower edge .. .. *Metalopha.*

b. Frons smooth.

a[1]. Proboscis aborted, non-functional.

a[2]. Thorax clothed with hair and hair-like scales. *Leucochlæna.*

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b^2. Thorax clothed with hair only .. .. *Cteipolia.*

b^1. Proboscis fully developed.

a^2. Tegulæ produced into a more or less prominent dorsal ridge.

a^3. Palpi with the 3rd joint long and dilated at extremity.

a^4. Abdomen with dorsal series of crests, not flattened .. .. .. *Euscotia.*

b^4. Abdomen flattened, without dorsal series of crests .. .. .. *Elvesia.*

b^3. Palpi with the 3rd joint short.

a^4. Abdomen dorsally flattened .. *Amathes.*

b^4. Abdomen not dorsally flattened .. *Dichonia.*

b^2. Tegulæ not produced into a dorsal ridge.

a^3. Abdomen with dorsal crests on basal segments.

a^4. Thorax clothed with hair and scales mixed.

a^5. Eyes rather small .. .. *Nyctycia.*

b^5. Eyes large.

a^6. Thorax clothed chiefly with scales.

a^7. Thorax quadrately scaled .. *Daseuplexia.*

b^7. Thorax not quadrately scaled.

a^8. Thorax with divided ridge-like crest .. .. *Pachypolia.*

b^8. Pro- and meta-thorax with spreading crests.. .. *Eumichtis.*

b^6. Thorax clothed with rough spatulate scales and hair .. .. *Valeria.*

c^6. Thorax clothed with hair with a few scales mixed .. .. *Antitype.*

b^4. Thorax clothed with hair and hair-like scales.

a^5. Palpi with the 3rd joint very long, dilated at extremity and porrect .. *Sydiva.*

b^5. Palpi with the 3rd joint short.

a^6. Thorax with divided crest; forewing with the termen crenulate .. *Rhizotype.*

b^6. Thorax with spreading crest; forewing with the termen not crenulate.. .. .. .. *Bombycia.*

b^3. Abdomen with dorsal crest at base only.

a^4. Thorax clothed chiefly with scales .. *Bryotype.*

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b^1. Thorax clothed with hair with a few scales mixed, and without distinct crests .. .. *Bryomima.*

c^1. Thorax clothed with hair and hair-like scales and with spreading crests on pro and meta-thorax .. .. *Blepharidia.*

d^1. Thorax clothed with hair only and without distinct crests .. .. *Dimya.*

c^3. Abdomen without dorsal crests.

a^1. Eyes small, reniform .. .. *Hypsophila.*

b^1. Eyes large, rounded .. .. *Cosmia.*

Genus CUCULLIA.

	Type.
Cucullia, Schrank, Fauna Boica ii., (2) p. 157 (1802) ..	*artemisiæ.*
Euderea, Hübn. Verz., p. 245 (1827)	*asteris.*
Eucalimia, Hübn. Verz., p. 245 (1827)	*gnaphalii.*
Callænia, Hübn. Verz., p. 246 (1827)	*umbratica.*
Argyritis, Hübn. Verz., p. 247 (1827)..	*artemisiæ.*
Rancora, Smith, Ent. News., iii, p. 253 (1892); id. Trans. Am. Ent. Soc., xxi., p. 82 (1894)	*strigata.*
Tribonophora, Hübn. Tent. incd.	*umbratica.*

A. Forewing without distinct dark facia on middle of inner margin.

a. Forewing with the orbicular and reniform more or less distinctly defined.

a^1. Forewing with the postmedial line angled outwards at vein 5, then almost straight, oblique. *albipennis.*

b^1. Forewing with the postmedial line irregular towards inner margin .. .. .. *nigrifascia.*

b. Forewing with the orbicular and reniform almost obsolete .. .. *pullata.*

B. Forewing with distinct dark fascia on middle of inner margin.

a. Forewing with the orbicular and reniform more or less distinctly defined.

a^1. Forewing with the orbicular elliptical .. *elongata.*

b^1. Forewing with the orbicular small, round .. *brevipennis.*

b. Forewing with the orbicular and reniform defined by dark points.

a^1. Hindwing nearly evenly suffused with brown .. *stigmatophora.*

b^1. Hindwing white, the veins and terminal area suffused with brown .. .. .. *blattariæ.*

1809. CUCULLIA ALBIPENNIS.

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1808. CUCULLIA NIGRIFASCIA.

1812. CUCULLIA PULLATA.

1807. CUCULLIA ELONGATA, Butl; A. M. N. H. (5) vi., p. 67 (1880); id. Ill. Het. B. M. vi., p 11, pl. 103, f. 7.

" *albesceus*, Moore., P. Z. S., 1881, p. 357, Staud. Cat. Lep. Pal., p. 215.

" *atkinsoni*, Moore., Lep. Atk., p. 131 (1882).

" *postera*, Staud. Rom. Mém. vi., p. 524 (1892).

Habitat.—W. SIBERIA; E. SIBERIA; TIBET; KASHMIR; PUNJAB; SIKHIM.

1810. CUCULLIA BREVIPENNIS.

1811. CUCULLIA STIGMATOPHORA.

1811 *a*. CUCULLIA BLATTARIÆ.

Noctua blattariæ. Esp. Schmett. iv., pl. 154, f. 4 (1786); Frr. Brrit., pl. 81. Herr. Schäff. Eur. Schmett. Noct., pp. 202-3. Staud. Cat. Lep. Pal., p. 215.

Cucullia caninæ. Ramb. Ann. Soc. Ent. Fr. 1883., p. 19, pl. 1, f. 5; Dup. Lép. Fr. Suppl. iii., p. 415, pl. 37, f. 2.

" *scrophularivora* Guen. Noct. ii, p. 130 (1852).

Head and thorax whitish tinged with rufous; palpi, two bars on frons and back of head dark rufous; tegulæ with blackish line near base, traces of a medial line and dark rufous tips; patagia with some black scales towards upper edge which is dark rufous; thorax dorsally blackish; mid and hind tibiæ with black points at their extremities; abdomen whitish tinged with red-brown, the crests dark. Forewing grey-white, more or less suffused with rufous, leaving the inner half paler; the costal area darker; subbasal line represented by an oblique striga from costa; antemedial line double below submedian fold, angled strongly outwards in the interspaces and inwards on the veins, above inner margin angled outwards to the postmedial line, its outer part forming a black streak; orbicular and reniform defined by some black points; postmedial line obsolescent, except below vein 2, where it forms a whitish lunule defined on each side by brown lines, and with a smaller lunule below it above inner margin; some whitish points on costa towards apex; an oblique series of slight rufous streaks between vein 6 and apex, and another series from termen below apex to vein 4, a prominent oblique streak below vein 2 with slight white and brown streaks below it; cilia blackish at base, grey at tips and intersected with white. Hindwing white tinged with brown, the veins and terminal area suffused with brown, in female mostly suffused with brown; cilia whitish with a brown line through them; the underside with slight discoidal lunule.

Habitat.—EUROPE; ARMENIA; ASIA MINOR SYRIA; KASHMIR. *Exp.* 44-52 mill.

Larva.—Kirby, Butt. and Moths, Eur. p. 255.

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Citron-yellow above with black spots often conjoined into the form of a cross; sides grey dotted with black; head brown or red. Foodplants, the flowers and seeds of different species of *Scrophularia* 6-7.

Genus METALOPHA.

Type.

Metalopha, Staud. Iris. iv., p. 313 (1891) .. .. *liturata.*

Proboscis fully developed; palpi obliquely upturned, fringed with rough hair in front, the third joint short; frons with large corneous prominence with raised edges, its lower edges produced to a trilobate process; eyes large, round; antennæ of male simple, laminate; head and thorax clothed with rough hair, the vertex of head with large crest, the pro- and meta-thorax with double crests; pectus and tibiæ clothed with long hair; abdomen with some rough hair at base and lateral fringes of hair, but without crests. Forewing with the apex somewhat produced, the termen obliquely curved; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 rather strong from below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

2015. METALOPHA CASHMIRENSIS.

Genus LEUCOCHLÆNA.

Type.

Leucochlæna, Hmpsn. Cat. Lep. Phal. B. M. vi., p. 132 (1906).. *hispida.*

Proboscis minute; palpi porrect to just beyond frontal tuft and fringed with long hair below; frons smooth; eyes large, rounded; antennæ of male bipectinated with long branches to apex; head and thorax clothed with hair and hairlike scales, the pro- and meta-thorax with spreading crests; pectus and legs clothed with long hair; abdomen with some rough hair at base and lateral fringes of hair, but without crests. Forewing with the apex rounded, the termen obliquely curved and somewhat crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1708. LEUCOCHLÆNA LEUCOCERA.

Genus BOMBYCIA.

Type.

Bombycia, Steph. Ill. Brit. Ent. Haust. iii., p. 57 (1829). nec. Hübn. Tent. ined. .. .. *viminalis.*

Cleoceris, Boisd. Ind. Meth. p. 93 (1840) .. .. *viminalis.*

Hyada, Moore, Lep. Atk. p. 129 (1881) .. .. . *grisea.*

Sect. (*Hyada*). Antennæ of male with fascides of extremely long cilia.

1799. BOMBYCIA GRISEA.

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Genus EUSCOTIA.

1806. EUSCOTIA INEXTRICATA.

Genus DICHONIA.

	Type.
Dichonia, Hübn. Verz., p. 217 (1827)	*areola.*
Xylocampa, Guen. Ann. Soc. Ent. Fr. 1837, p. 227 ..	*areola.*

Proboscis fully developed; palpi with the 2nd joint oblique, clothed with long hair, the 3rd porrect; frons smooth, with large frontal tuft; eyes large, rounded; antennæ of male typically nearly simple; head and thorax chiefly clothed with scales, the tegulæ dorsally produced to a ridge, the head, pro- and meta-thorax with spreading crests; pectus and tibiæ clothed with long hair; abdomen with dorsal series of crests and lateral fringes of hair. Forewing rather narrow, the termen obliquely curved; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male ciliated.

A. Forewing with the terminal area blackish.. .. *lubrica.*

B. Forewing with the terminal area concolorous.

a. Forewing with bidentate white mark beyond the claviform and black streak from it to post-medial line .. .. *obliquisigna.*

b. Forewing without bidentate white mark beyond the claviform, or black streak from it to post-medial line .. .. *chlorota.*

1778. DICHONIA LUBRICA.

1789*a*. DICHONIA OBLIQUISIGNA.

1789*b*. DICHONIA CHLOROTA, Hmpsn., A. M. N. H. (8), iv, p. 386 (1909).

♂. Head and thorax grey-white mixed with brown and some black; palpi and antennæ blackish; tarsi blackish with slight pale rings; abdomen grey suffused with brown, the crest on 3rd segment tipped with black. Forewing grey-white suffused with brown and irrorated with black, the medial area somewhat darker; subbasal line black, waved, from costa to vein 1; antemedial line black, oblique, sinuous, angled outwards above inner margin, the area before it pale tinged with olive green; claviform whitish defined by black except above; orbicular and reniform with whitish annuli defined by black, the former round; postmedial line black, bent outwards below costa, then dentate, excurved to vein 4, then oblique, some white points beyond it on costa with slight dark streaks between them; subterminal line represented by a series of dentate brownish marks with

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dentale pale olive green marks beyond them on termen; cilia brown with a series of whitish points at base. Hindwing greyish suffused with brown; an indistinct dark postmedial line; cilia with a series of whitish points at base; the underside grey-white irrorated with brown, a diffused brown discoidal spot and postmedial line.

Habitat.—KASHMIR. *Exp.* 36 mill.

Genus NYCTYCIA.

Type.

Nyctycia, Hmpsn., Cat. Lep. Phal., B. M. vi., p. 299 (1906) .. *persimilis.*

Proboscis fully developed; palpi porrect to just beyond frontal tuft and fringed with long hair below; frons smooth; eyes rather small and somewhat reniform; antennæ of male minutely serrate with fascicles of long cilia; head and thorax smoothly clothed chiefly with scales, the pro- and metathorax with spreading crests; pectus and legs clothed with rather long hair; abdomen with dorsal crests on basal segments. Forewing rather long and narrow, the termen obliquely curved and somewhat crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell Hindwing with veins 3·4 shortly stalked; 5 obsolescent from just below angle of discocellulars; 6·7 shortly stalked; 8 anastomosing with the cell near base only.

Sect. I.—Palpi with the 3rd joint long and dilated at extremity.

1707*a*. NYCTYCIA PLAGIOGRAMMA, Hmpsn., Cat. Lep. Phal., B. M., vi, p. 299 (1906).

♂. Head and thorax reddish brown mixed with fuscous; palpi blackish at sides; frons with black bar; antennæ blackish; tegulæ with black medial shade; tarsi black with pale rings; abdomen ochreous brown suffused with fuscous except anal tuft and base of ventral surface. Forewing ochreous brown irrorated with fuscous; a sinuous black streak below base of cell; subbasal line represented by a black point on costa; antemedial line double at costa, then single, oblique to submedian fold, then obsolete; claviform fuscous defined by black and confluent with lower edge of orbicular, which has a slight greyish annulus defined by black, somewhat oblique elliptical; reniform slightly defined by black, an irregular sinuous medial line; postmedial line bent outwards below costa, then somewhat dentate and produced to short streaks on the veins, excurved to vein 4, oblique to submedian fold, then bent outwards, some pale points beyond it on costa; subterminal line greyish slightly defined on each side by black, minutely waved, slightly excurved at vein 7 and middle, with black streaks beyond it in the interspaces; a fine waved terminal line; cilia with fine pale line at base. Hindwing yellowish brown tinged with fuscous, the termen rather darker; cilia brownish ochreous with a dark line through them; the underside whitish irrorated with brown, a black discoidal lunule and indistinct sinuous postmedial line.

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Habitat.—PUNJAB, Simla. *Exp.* 28 mill.

Sect. II.—Palpi with the 3rd joint short.

1707. NYCTYCIA PERSIMILIS.

Genus DASEUPLEXIA.

Type.

Daseuplexia, Hmpsn., Cat. Lep. Phal., B. M. vi., p. 303 (1906)..*lagenifera*

Proboscis fully developed; palpi upturned, the 2nd joint fringed with long hair in front, the 3rd porrect; frons smooth, with tuft of scales on it and another between antennæ; eyes large, rounded; thorax clothed almost entirely with scales and quadrately scaled, the prothorax with divided crest, the metathorax with spreading crest; abdomen with dorsal series of crests on basal segments and with lateral fringes of hair on terminal segments. Forewing with the apex somewhat produced, the termen crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with the termen sinuous; veins 3·4 from angle of cell; 5 obsolescent from just below angle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male bipectinate with long branches, the apex simple.

1761. DASEUPLEXIA LAGENIFORMIS.

Sect. II.—Antennæ of male minutely serrate and fasciculate.

1740. DASEUPLEXIA LAGENIFERA.

Genus PACHYPOLIA.

Type.

Pachypolia, Grote, 6th Rep. Peab. Acad. Sci., p. 27 (1874)...*atricornis.*

Proboscis fully developed; palpi obliquely upturned, the 2nd joint fringed with hair in front, the 3rd short; frons smooth; eyes large, rounded; antennæ of male typically bipectinated with rather long branches, the apex simple; head and thorax clothed chiefly with scales, the thorax with divided dorsal ridge-like crest; pectus and legs clothed with long hair; abdomen with dorsal crests on basal segments. Forewing rather narrow, the termen obliquely curved; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle or shortly stalked; 8 anastomosing with the cell near base only.

Sect. II.—Antennæ of male ciliated.

1761*a*. PACHYPOLIA HIMALAYENSIS, Hmpsn., Cat. Lep. Phal., B. M. vi., p. 312 (1906).

♂. Head and tegulæ ochreous tinged with rufous; sides of palpi and frons blackish; tegulæ with black medial line; thorax deep rufous, the dorsal crest tipped with ochreous; pectus clothed with purplish pink and

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brown hairs, the tarsi ringed black and pinkish ochreous; abdomen fuscous mixed with rufous and with slight greyish segmental lines, the anal tuft pale rufous. Forewing ochreous almost wholly suffused with purplish red-brown, the terminal area with fuscous, the veins with slight dark streaks; subbasal line represented by two slight striæ from costa; antemedial line double filled in with ochreous, angled outwards below costa then excurved to vein 1, where it is slightly angled inwards; claviform large, defined by black; orbicular with brown centre and ochreous annulus defined by black, oblique elliptical; reniform with fuscous centre and ochreous annulus defined by black on inner side only, somewhat constricted at middle and with its lower extremity dentate; a slight medial line; postmedial line double filled in with ochreous, bent outwards below costa, then minutely dentate, excurved to vein 4, then incurved to lower edge of reniform, some brown and ochreous striæ beyond it on costa, a black streak from it to termen above vein 4; subterminal line ochreous defined by rufous on inner side forming somewhat dentate marks at middle, very slightly angled outwards at vein 7 and dentate at veins 4·3, with black streaks from it to termen above veins 3 and 2; a terminal series of black points; cilia fuscous brown with fine pale line at base followed by a slight dark line. Hindwing greyish nearly uniformly suffused and irrorated with brown; a fine dark terminal line; cilia ochreous with a black line through them; the underside whitish irrorated with brown, strongly on costal area, a black discoidal lunule and sinuous postmedial line.

Habitat.—SIKHIM. *Exp.* 38 mill.

Genus EUMICHTIS.

				Type.
Eumichtis, Hübn. Verz., p. 211 (1827)..	..	..		*lichenea.*
Crino., Hübn. Verz., p. 216 (1827) ..	..	..		*sommeri.*
Epunda, Dup. Cat. Meth., p. 141 (1844)	..	..		*lichenea.*

Proboscis fully developed; palpi upturned, the 2nd joint fringed with hair, the 3rd typically short; frons smooth; eyes large, rounded; antennæ of male typically bipectinated with rather long branches to apex; head and thorax clothed almost entirely with scales, the pro- and metathorax with spreading crests; tibiæ fringed with long hair; abdomen with dorsal series of crests and lateral fringes of hair. Forewing rather short and broad, the termen crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. IV.—Antennæ of male minutely serrate and fasciculate.

A. Forewing with black streak in submedian fold between ante-and postmedial lines .. .. .. *adjuncta.*

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B. Forewing without black streak in submedial fold between ante-and postmedial lines .. .. *glenura.*

1714. EUMICHTIS ADJUNCTA.

2419*a*. EUMICHTIS GLENURA.

Sect. V.—Antennæ of male with fasciculate cilia.

1780. EUMICHTIS LEUCOSTICTA.

Genus VALERIA.

	Type.
Valeria, Steph. Ill. Brit. Ent. Haust. iii, p. 22 (1829) ..	*oleagina.*
Synvaleria, Butl. Trans. Ent. Soc., 1890, p. 672	*jaspidea.*

Proboscis fully developed; palpi upturned, the 1st and 2nd joints clothed with long hair in front, the 3rd porrect, rather long and dilated at extremity; frons smooth, tufted with long hair; eyes large, rounded; antennæ of male typically bipectinated with long branches to apex, of female with short branches; vertex of head with crest; thorax clothed with long spatulate scales and hair, the pro and metathorax with spreading crests; pectus clothed with long hair; abdomen with series of large dorsal crests and lateral fringes of hair. Forewing with the termen crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. II.—Antennæ of male bipectinate with long branches, the apex serrate.

1672. VALERIA HETEROCAMPA.

Sect. III.—Antennæ of male bipectinate with short branches, the apex serrate, of female ciliated.

1757. VALERIA VIVIDINIGRA, Hmpsn., Moths Ind., iv., p. 510 (1896).
Euplexia icamba, Hmpsn., Moths Ind., ii, p. 222 (nec Swinh).

Sect. IV.—Antennæ of male minutely serrate and fasciculate.

A. Forewing with the ground colour olive-green.

a. Forewing with the postmedial line incurved at discal fold .. .. *pardaria.*

b. Forewing with the postmedial line not incurved at discal fold .. .. *mucronata.*

B. Forewing ochreous white tinged with olive .. .. *icamba.*

1761. VALERIA PARDARIA.

1754. VALERIA MUCRONATA.

1755. VALERIA ICAMBA, Swinh. A. M. N. H. (6) xii, p. 260 (1893).
Euplexia heterocampoides, Hmpsn., Moths Ind., ii, p. 221 (1894).

Genus ANTITYPE.

	Type.
Antitype, Hübn. Verz., p. 212 (1827)	*chi.*
Polia. Hübn. Tent. incd. (necTreit.)	*flavicineta*

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Proboscis fully developed; palpi obliquely upturned, short, the 2nd joint thickly clothed with hair in front; frons smooth; eyes large; antennæ of male typically ciliated; thorax clothed chiefly with scales or with hair and hair-like scales, the pro and metathorax with spreading crests; pectus clothed with long hair; tibiæ fringed with hair; abdomen with dorsal crests on basal segments. Forewing with the termen crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. II.—Antennæ of male more or less strongly serrate and fasciculate.

1799*a*. ANTITYPE CALAMISTIS, Hmpsn., Cat. Lep. Phal. B. M. vi., p. 365, pl. 104, f. 28 (1906).

♂. Head, thorax and abdomen pale ochreous with a few fuscous scales; sides of palpi and frons fuscous; antennæ fuscous; patagia with indistinct black line near upper edge; tarsi black ringed with ochreous. Forewing pale silky ochreous tinged in parts with fuscous and sparsely irrorated with black; subbasal line represented by black striæ from costa and cell with some black scales beyond its lower extremity; antemedial line ill-defined. rather oblique, waved; claviform small, indistinctly defined by black; orbicular and reniform large, pale, indistinctly defined, the former round, the latter somewhat angled inwards on median nervure and with some pale points on its edges; traces of a medial line, oblique from costa to median nervure, then slightly waved, the area beyond it tinged with fuscous; postmedial line bent outwards below costa, then dentate, excurved to vein 4, then incurved; a subterminal series of slight pale points defined on inner side by small dentate black marks except towards costa, those above and below vein 5 more prominent; a terminal series of small black lunules. Hindwing ochreous suffused with fuscous; cilia ochreous with a fuscous line through them; the underside ochreous irrorated with fuscous, a discoidal lunule, a waved postmedial line bent inwards to costa and incurved below vein 4, a terminal series of small lunules.

Habitat.—KASHMIR, Dras. *Exp.* 48 mill.

Genus RHIZOTYPE.

Type.

Rhizotype, Hmpsn., Cat. Lep. Phal. B. M. vi., p. 573 (1906).. *flammea.*

Proboscis fully developed, palpi with the 2nd joint oblique, fringed with long hair below, the 3rd porrect; frons smooth; eyes large, rounded; antennæ of male minutely serrate and fasciculate; head and thorax clothed with hair and hair-like scales; vertex of head with crest; prothorax with large divided crest, metathorax with spreading crest; pectus clothed with long hair; abdomen with dorsal series of crests. Forewing with the termen crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9

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from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with the ground colour bluish-grey .. .. *poliorhiza.*

B. Forewing with the ground colour brownish-grey .. *paucinotata.*

1806*a*. RHIZOTYPE POLIORHIZA.

1814. RHIZOTYPE PAUCINOTATA.

Rhizogramma subdetersa, Staud Iris. viii, p. 325 (1895); id. Cat. Lep. Pal., p. 183.

Habitat.—TIBET: W. CHINA; KASHMIR.

Genus SYDIVA.

Type.

Sydiva, Moore, Lep. Atk., p. 65 (1882) .. .. *nigrogrisea.*

Proboscis fully developed; palpi with the 2nd joint obliquely upturned and fringed with hair in front, the 3rd porrect, very long and dilated at extremity; frons smooth; eyes large, rounded; antennæ of male minutely serrate and fasciculate; head and thorax clothed with long rough hair and hair-like scales, the vertex of head crested, the thorax without distinct crests; pectus and tibiæ clothed with long hair; abdomen clothed with rough hair; a series of dorsal crests on basal segments and lateral fringes of hair. Forewing with the apex somewhat produced, the termen obliquely curved, crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1765. SYDIVA NIGROGRISEA.

Genus BRYOTYPE.

Type.

Bryotype, Hmpsn., Cat. Lep. Phal. B. M. vi., p. 382 (1906) .. *mesomelana.*

Proboscis fully developed; palpi oblique, fringed with hair in front, the 3rd joint short; frons smooth; eyes large, rounded; head and thorax clothed chiefly with scales, the prothorax with divided crest, the metathorax with spreading crest; tibiæ fringed with hair; abdomen with dorsal crest at base only. Forewing with the termen crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 shortly stalked; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male minutely serrate and fasciculate.

1781. BRYOTYPE FLAVIPICTA.

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Sect. II.—Antennæ of male ciliated.

1734*a*. BRYOTYPE MESOMELANA.

Genus BRYOMIMA.

Type.

Bryomima, Staud. Iris. xii., p. 357 (1899) .. .. .. *carducha*.

Proboscis fully developed; palpi obliquely upturned, the 2nd joint fringed with hair, the 3rd short; frons smooth; eyes large, rounded; antennæ of male ciliated or almost simple; head and thorax clothed with hair and a few scales mixed, without distinct crests; tibiæ fringed with long hair on outer side; abdomen with dorsal crest at base only. Forewing with the termen obliquely curved; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male with fasciculate cilia.

A. Forewing with the ante- and postmedial lines filled in with whitish .. .. *centralasiæ*.

B. Forewing with the ante- and postmedial lines not filled in with whitish.

a. Forewing more or less tinged with ochreous .. *chamæleon*.

b. Forewing olive-grey without ochreous tinge .. *virescens*.

1789. BRYOMIMA CENTRALASIÆ.

Polia centralasiæ, Staud. Stett. Ent. Zeit. xliii, p. 37 (1881); Alph. Hor. Soc. Ent. Ross, xvii, p. 77, pl. 3, f. 54; Staud. Cat. Lep. Pal., p. 180.

Hecatera transversa, Moore, Lep. Atk., p. 125 (1882).

„ *modesta*, Moore, Lep. Atk., p. 125 (1882).

Polia asiatica, Alph. Stett. Ent. Zeit. 1887, p. 169; id. Rom. Mèm. v., p 156, pl. 6, f. 7.

1789*b*. BRYOMIMA CHAMÆLEON.

Polia chamæleon, Alph. Stett. Ent. Zeit., 1887, p. 169; id. Rom. Mèm. v., p. 153, pl. 6, ff. 8.*a.b.* Staud. Cat. Lep. Pal., p. 180.

Head and thorax grey tinged with olive-yellow and reddish brown; tegulæ with slight dark medial line; patagia with bluish fuscous line near edges; tarsi banded with fuscous; abdomen grey tinged with ochreous and brown and irrorated with fuscous. Forewing grey more or less suffused with pale-reddish ochreous and thickly irrorated with fuscous; subbasal line represented by double black striæ from costa and cell; antemedial line double, minutely waved, angled inwards on vein 1; claviform short and broad, defined by black except above; orbicular and reniform with reddish annuli defined by black, both rather open above and below and constricted at middle; a rather diffused minutely waved medial line; post-

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medial line slightly bent outwards below costa, then dentate, below vein 4, incurved to lower edge of reniform; a reddish subterminal line defined on inner side by small dentate blackish marks below costa and at middle, and with slight blue-grey suffusion beyond it, slightly angled outwards at vein 7 and excurved at middle; a terminal series of black points; cilia ochreous with a fuscous line through them. Hindwing ochreous nearly uniformly suffused with fuscous; cilia ochreous with a fuscous line through them; the underside whitish irrorated with fuscous, the costal area tinged with ochreous, a discoidal lunule, a diffused irregular postmedial line showing through to upperside, some fuscous suffusion on termen.

Habitat.—W. TURKISTAN; E. TURKISTAN; KASHMIR, Barra Larcha, Koksu Kiujar; PUNJAB, Kulu. *Exp.* 48 mill.

1798. BRYOMIMA VIRESCENS.

Genus BLEPHARIDIA.

Type.

Blepharidia, Pung. Iris. xiii., p. 122 (1900) .. .. .. *lama.*

Proboscis fully developed; palpi upturned, the 2nd joint fringed with long hair in front; frons smooth; eyes large, rounded; antennæ of male typically minutely serrate and fasciculate; head and thorax clothed with hair and hair-like scales, the pro- and metathorax with spreading crests; tibiæ fringed with hair; abdomen with dorsal crest at base only. Forewing with the termen crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 shortly stalked; 8 anastomosing with the cell near base only.

Sect. III.—Antennæ of male minutely serrate and fasciculate.

1794*a*. BLEPHARIDIA PASPA.

Trigonophora grumi, Alph. Hor. Soc. Ent. Ross. xxvi., p. 449 (1892) nec. p. 447; id. Rom. Mém. ix., p. 29, pl. 1, f. 8; Staud. Cat. Lep. Pal., p. 184.

Blepharidia paspa, Püng. Iris. xiii, p. 123 (1900).

Head and thorax red-brown; tarsi dark brown with pale rings; abdomen ochreous brown. Forewing red-brown; the postmedial area brownish ochreous; subbasal line double, waved, from costa to submedian fold, with a greyish patch beyond it above vein 1, with black streak below it above inner margin; antemedial line double filled in with greyish, oblique, slightly waved, bent inwards to inner margin; claviform small, defined by black; orbicular and reniform small, with brown centres and whitish annuli defined by black, the former oblique, rather oblong, the latter narrow, open above and below; an indistinct medial line, oblique from costa to lower angle of cell; postmedial line indistinctly double, filled in with ochreous, bent outwards below costa, then minutely waved, very oblique below vein 4, some whitish points beyond it on costa; subterminal line whitish, defined

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on inner side by a dark patch at costa and slight somewhat dentate marks at middle, angled outwards at vein 7 and dentate at veins 4·3; a terminal series of slight dark lunules; cilia with pale rufous line at base and intersected with rufous. Hindwing reddish-brown tinged with fuscous; a medial dark line and indistinct diffused subterminal band; the underside greyer with small discoidal lunule.

Habitat.—TIBET: KASHMIR, Kiujar. *Exp.* 38 mill.

Sect. IV.—Antennæ of male ciliated.

1794. BLEPHARIDIA GRISEIRUFA.

Genus DIMYA.

	Type.
Dimya, Moore, Lep. Atk, p. 121 (1882)	..*sinuata.*
Trichoridia, Hmpsn., Cat. Lep. Pal. B. M. vi., p. 400 (1906)	..*herchatra.*

Proboscis fully developed; palpi upturned, the 2nd joint fringed with hair in front; frons smooth; eyes large, rounded; antennæ of male fasciculate or ciliated; head and thorax clothed with hair only, the vertex of head crested, the prothorax with spreading crest; pectus and legs fringed with long hair; abdomen with dorsal crest at base only and lateral fringes of hair. Forewing with the apex rather produced and acute, the termen crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I. (Dimya).—Antennæ of male fasciculate.

1797. DIMYA SINUATA.

Sect. II. (Trichoridia).—Antennæ of male ciliated.

A. Forewing with the orbicular and uniform confluent with a pale mark on median nervure .. .. *junctura.*

B. Forewing with the orbicular and uniform separate.

a. Forewing with the postmedial line not dentate. *endroma.*

b. Forewing with the postmedial line dentate.

a^1 Forewing without yellow or white lunules on subterminal line.

a^2 Forewing without white marks on reniform.

a^3 Forewing rufous .. .. .. *dentata.*

b^3 Forewing deep purplish grey..... *canosparsa.*

b^2 Forewing with white lunule on reniform .. *albiluna.*

c^2 Forewing with white annulus to reniform. *cuprescens.*

b^1 Forewing with white lunules on subterminal line .. .. *sichimensis.*

c^1 Forewing with yellow lunules on subterminal line .. .. *herchatra.*

1796. DIMYA JUNCTURA.

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1790. DIMYA ENDROMA.

1791. DIMYA DENTATA.

1788. DIMYA CANOSPARSA.

1788 *a*. DIMYA ALBILUNA, Hmpsn., Cat. Lep. Pal. B. M. vi, p. 404, pl. 105, f. 24 (1906).

♀. Head and thorax dark-brown mixed with ochreous and a few white hairs; pectus with ochreous hairs; tarsi ringed with yellow; abdomen grey-brown with the anal tuft fulvous. Forewing dark brown irrorated with blue-white scales except on medial area where the costal area and veins only are irrorated; subbasal line represented by slight blackish marks below costa and cell; antemedial line double, the inner line indistinct; angled outwards below costa, excurved from cell to inner margin; claviform moderate, defined by black; orbicular irrorated with blue-white and defined by black, round; reniform defined by blackish and with ochreous white lunule on its outer edge; an indistinct waved medial line; postmedial line bent outwards below costa, then dentate, excurved to vein 4, then incurved some white points beyond it on costa; subterminal line yellow-brown defined on each side by diffused black and with brown mark on its inner side below vein 7, angled outwards at vein 7 and excurved at middle; a terminal series of small black lunules; cilia black mixed with ochreous and with slight black line through them. Hindwing ochreous brown with slight discoidal spot, sinuous postmedial line, and diffused sub-terminal band; cilia ochreous with a diffused black line, near base; the underside brownish ochreous irrorated with brown, the terminal area suffused with brown, a small discoidal spot and rather diffused postmedial line excurved at median nervures, then incurved.

Habitat.—SIKHIM TIBET, Yatung. *Exp.* 38 mill.

1788*b*. DIMYA CUPRESCENS, Hmpsn., Cat., Lep. Pal. B. M. vi, p. 405, pl. 105, f. 25 (1906).

♀. Head and thorax rufous; abdomen ochreous tinged with rufous. Forewing cupreous brown slightly suffused with purplish grey especially on basal and postmedial areas; subbasal line represented by a slight grey striga from costa; antemedial line indistinctly double, filled in with grey waved, rather oblique; claviform absent; orbicular very faint with greyish centre defined by cupreous brown, small, round, reniform a narrow lunule with white annulus; postmedial line indistinctly double filled in with grey, bent outwards below costa, then dentate, oblique below vein 4; subterminal line only represented by the contrast between the greyish and cupreous areas; some whitish irroration on termen at extremity of veins. Hindwing ochreous-white suffused with cupreous brown, the terminal area rather darker; cilia rufous, paler at tips; the underside greyish irrorated with brown, the costal area tinged with ochreous, a slight discoidal lunule, sinuous postmedial line, and faint subterminal line.

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Habitat.—SIKHIM TIBET, Yatung. *Exp.* 34 mill.

1787. DIMYA SICHIMENSIS.

1786. DIMYA HERCHATRA.

Genus HYPSOPHILA.

Type.

Hypsophila, Staud. Stett. Ent. Zeit., 1888, p. 40 ..... *jugorum.*

Proboscis fully developed; palpi upturned to vertex of head and fringed with very long hair in front; frons smooth; eyes small, reniform; antennæ of male with fascicles of very long cilia; head and thorax clothed with long woolley hair only and without crests; pectus and leg clothed with woolley hair; abdomen clothed with woolley hair and without crests. Forewing triangular, the termen obliquely curved; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 shortly stalked; 8 anastomosing with the cell near base only.

1799*b*. HYPSOPHILA JUGORUM.

Heliothis jugorum, Ersch. Fedtsch. Reise, p. 48, pl. 3, f. 46 (1874); Staud. Cat. Lep. pal, p. 219.

Hypsophila haberhaueri, Staud. Stett. Ent. Zeit. 1882, p. 50.

" *pamira*, Staud. Stett. Ent. Zeit. 1888, p. 42.

♂. Head, thorax and abdomen clothed with greenish grey hair slightly tinged with rufous. Forewing greenish grey tinged with pale reddish brown and with slight dark irroration; antemedial line reddish brown, diffused, somewhat sinuous, oblique from costa to submedian fold where it is slightly angled outwards; orbicular very small, round, with slight grey annulus; reniform a fuscous lunule; postmedial line brown, very minutely dentate, oblique from costa to vein 6, excurved to vein 4, then obliquely incurved; subterminal line only defined by brown suffusion on inner side, its outer edge somewhat dentate and incurved at discal fold and below vein 3; a fine terminal dark line. Hindwing white, the basal and inner areas suffused with brown; a large blackish oblique oblong discoidal spot; terminal area black brown, its inner edge angled outwards at discal fold, then incurved to discoidal spot; cilia white. Underside of both wings whitish with the terminal area broadly fuscous leaving some whitish at apex of forewing beyond a dark bar from costa; both wings with large oblong black discoidal spot.

Ab. 1. *haberhaueri.*—Forewing with the ante-and post- medial lines defined by brown on medial area, approximated below the cell and conjoined into a brown band.

Ab. 2. *pamira.*—Forewing more uniform red-brown, the ante- and post-medial lines more approximated below submedian fold; hindwing with the

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basal and inner areas more suffused with brown, leaving the discoidal spot on a white patch.

Ab. 3. Hindwing with the inner edge of terminal band less incurved at middle and well separated from the discoidal spot.

Ab. 4. Forewing with the medial area suffused with red-brown; hindwing with the discoidal spot forming a narrow lunule well separated from the inner edge of terminal band which is excurved, not angled, at discal fold.

Habitat.—W. Turkiestan; E. Turkiestan; Kashmir, Deosai Plains, Gourais Valley, Shoroda. *Exp.* 24-30 mill.

Genus Cteipolia.

	Type.
Cteipolia, Staud Iris. ix, p. 191 (1896)	*sacelli.*

Proboscis aborted, minute; palpi porrect to just beyond frons and fringed with very long hair below; frons smooth; eyes small, elliptical; antennæ of male with very long cilia; head, thorax and abdomen clothed with long rough hair and without crests. Forewing very narrow, the termen obliquely curved; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 typically strongly stalked; 5 obsolescent from middle of discocellulars; 6·7 strongly stalked; 8 anastomosing with the cell near base only.

Sect. II.—Hindwing with veins 3·4 from angle of cell.

1799c. Cteipolia acrophila, Hmpsn., Cat. Lep. Pal. B. M. vi., p. 421 (1906).

Head, thorax and abdomen brownish fuscous mixed with grey. Forewing grey suffused and irrorated with brownish fuscous; an indistinct diffused blackish subbasal line; antemedial line rather indistinct and diffused, excurved below costa and in submedian interspace; orbicular and reniform represented by small whitish spots indistinctly defined by diffused black and almost or quite conjoined; postmedial line defined by grey on outer side, bent outwards below costa, then minutely dentate, incurved below vein 4; subterminal line defined by fuscous suffusion on inner side, excurved below costa and at middle; the costa towards apex with series of black and grey points; a terminal series of black points. Hindwing semi-hyaline grey suffused with fuscous brown; the underside with small discoidal spot.

Habitat.—Kashmir, Kardong, 14,000′, Hunza. *Exp.* 24-28 mill.

Genus Elvesia.

1597. Elvesia diplostigma.

Genus Amathes.

	Type.
Amathes, Hübn. Verz., p. 222 (1827)	*litura.*
Agrochola, Hübn. Verz., p. 229 (1827)	*pistacina.*

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	Type.
Rusina, Steph. Ill. Brit. Ent. Haust. ii, p. 111 (1829) ..	*circellaris.*
Anchoscelis, Guen. Aun. Soc. Ent. Fr. viii, p. 485 (1839) ..	*nitida.*
Dyschorista, Led. Noct. Eur., p. 143 (1857)	*iners.*
Spudæa, Snell, Vlind. Ned., p. 289 (1872)	*ruticilla.*
Heteromorpha, Failla. Ted. Nat. Sicil. x., p. 30 (1890) nec-Kirby Col. 1825	*ragusæ.*

Proboscis fully developed; palpi obliquely porrect, fringed with long hair in front, the 3rd joint short; frons smooth; eyes large, rounded; antennæ of male typically ciliated; head and thorax clothed with hair only, the tegulæ produced to a dorsal ridge, the pro- and metathorax without distinct crests; abdomen dorsally flattened, with lateral fringes of hair and some rough hair at base, but without crests. Forewing with the termen evenly curved; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. III. (*Amathes*).—Antennæ of male ciliated.

1597*a*. AMATHES PHŒOSOMA, Hmpsn., Cat. Lep. Phal. B. M. vi., p. 488, pl. 107, f. 5. (1906).

♀. Head and thorax palebrownish ochreous; abdomen fuscous brown, darker above. Forewing palebrownish ochreous with slight dark irroration; traces of a waved subbasal line from costa to submedian fold; antemedial line very indistinct, oblique, waved; orbicular with faint brown outline, round; reniform with slight whitish annulus faintly defined by brown, constricted at middle and with its lower part filled in with pale fuscous; traces of a diffused medial line, oblique from costa to lower angle of cell, then inwardly oblique and sinuous; postmedial line almost obsolete, bent outwards below costa, then dentate and produced to a series of dark points on the veins, oblique below vein 4; the postmedial area rather darker; subterminal line indistinct, pale, defined on inner side by diffused dentate dark marks, slightly angled outwards at vein 7 and excurved at middle; a series of black points just before termen connected by a slight waved terminal line; cilia pale at base, mixed with fuscous at tips. Hindwing fuscous brown, the costal area whitish; cilia whitish tinged with brown; the underside whitish slightly irrorated with brown; a discoidal point and sinuous postmedial line with diffused spot at discal fold.

Habitat.—PUNJAB, Kulu, Sultanpur. *Exp.* 36 mill.

Genus COSMIA.

	Type.
Cosmia, Ochs. Schmett. Eur. iv, p. 84 (1816) non descr.; Treit. Schmett. Eur. v (1), p. 379 (1825)	*fulvago.*
Ochria, Hübn. Verz., p. 233 (1827)	*aurago.*

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	Type.
Cirrhia, Hübn. Verz., p. 234 (1827)	*citrago.*
Citria, Hübn. Verz., p. 234 (1827)	*fulvago.*
Mellinia, Hübn. Verz., p. 234 (1827)	*palleago.*
Xanthia, Hübn. Tent. ined	*fulvago.*

Proboscis fully developed; palpi obliquely upturned, the 2nd joint fringed with hair in front, the 3rd moderate; frons smooth; eyes large, rounded: antennæ of male minutely serrate and fasciculate or ciliated; head and thorax clothed with hair only, the prothorax with ridge-like crest; abdomen with some rough hair at base and lateral fringes of hair but without crests. Forewing with the apex produced and acute, the termen excurved at middle, then oblique; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 shortly stalked or from angle; 8 anastomosing with cell near base only.

Sect. II (*Cosmia*).—Antennæ of male ciliated.

A. Forewing with the postmedial line double.

a. Forewing with the postmedial line minutely dentate .. .. *gilvago.*

b. Forewing with the postmedial line not dentate .. *rectilineata.*

B. Forewing with the postmedial line single.

a. Forewing with the postmedial line angled outwards below costa and excurved at middle.

a^1. Forewing with the ground colour yellow.

a^2 Forewing without two white spots on lower extremity of reniform .. .. *melonina.*

b^2 Forewing with two white spots on lower extremity of reniform .. .. .. *distigmata.*

b^1 Forewing with the ground colour ochreous suffused with reddish and irrorated with brown .. *albosignata.*

b. Forewing with the postmedial line excurved from costa to vein 6, then oblique .. .. *approximata.*

1595. COSMIA GILVAGO.

1596. COSMIA RECTILINEATA.

1593. COSMIA MELONINA.

1593*a*. COSMIA DISTIGMATA, Hmpsn., Cat. Lep. Phal. B. M., vi., p. 509, pl. 107, f. 19 (1906).

♀. Head and thorax orange-yellow largely mixed with red; tegulæ edged with brown behind; abdomen reddish ochreous dorsally suffused with brown. Forewing orange-yellow suffused and irrorated with red, the veins brown; a curved red subbasal line from costa to submedian fold; antemedial line excurved below costa, bent inwards in cell, angled outwards

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in submedian fold, inwards on vein 1, then excurved to inner margin: claviform defined by red at extremity only, very large; orbicular and reniform yellow defined by red and with some red in centres, the former round, the latter with two small white spots at its lower extremity beyond lower angle of cell; an indistinct dark medial shade, oblique from costa to reniform, inwardly oblique below the cell, postmedial line brown, bent outwards below costa, then minutely dentate, excurved to vein 4, then oblique, a diffused oblique fuscous bar beyond it from costa to discal fold, with slight yellow points at costa; subterminal line red defined by yellow on outer side, dentate, slightly angled outwards at vein 7 and excurved at middle; a fine waved brown terminal line; cilia yellow intersected by brown at the veins and with a diffused brown line through them. Hindwing yellow suffused with brown, leaving the costal area, a patch in end of cell, and the termen and cilia yellow; the underside pale yellow, the costal area tinged and irrorated with red, the inner half tinged with brown, an indistinct sinuous postmedial line.

Habitat.—PUNJAB, Kulu, Sultanpur. *Exp.* 44 mill.

1592. COSMIA ALBOSIGNATA.

1592*a*. COSMIA APPROXIMATA, Hmpsn., Cat. Lep. Phal. B. M., vi., p. 511, pl. 107, f. 22 (1906).

Head and thorax rufous; pectus clothed with whitish hair; abdomen ochreous dorsally suffused with brown. Forewing rufous with very slight darker irroration, the veins brown; subbasal line rufous, slightly curved, from costa to submedial fold, the antemedial line rising from costa just beyond it, very oblique, slightly excurved below costa and above inner margin; claviform large, faintly defined by rufous, orbicular and reniform large, defined by rufous, the former oblique elliptical; a rufous medial shade, oblique below costa and joining the antemedial line at inner margin; postmedial line excurved below costa, then oblique, very slightly incurved below vein 3; the postmedial area slightly suffused with brown; subterminal line dentate, slightly angled outwards at vein 7 and excurved at middle; a fine waved terminal line; cilia with a fine brown line through them. Hindwing pale yellow, the inner area suffused with brown; a faint slightly curved postmedial line and traces of a diffused subterminal band; the underside with the costal area slightly tinged with rufous, a discoidal point and slight sinuous postmedial line.

Habitat.—KASHMIR, Dugi Pass, Jalauri Pass, Dana. *Exp.* 36 mill.

Sub-family ACRONYCTINÆ.

Proboscis usually fully developed, often aborted or absent; palpi usually short, upturned or porrect, the 3rd joint sometimes long and dilated at extremity; frons sometimes with rounded prominence with corneous plate below it, or with corneous processes of various forms;

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eyes naked, without bristly cilia from their margins, the eyes usually large and round, rarely small and reniform; antennæ usually ciliated, sometimes serrate or pectinated, more rarely laminated or almost simple; head and thorax clothed with hair and scales, when there are usually spreading or divided crests on the pro- and metathorax, sometimes with a flattened crest on prothorax projecting backwards, or a sharp triangular crest or dorsal ridge-like crest, or clothed with hair only, the tegulæ rarely produced dorsally into a ridge, or in one or two genera produced behind into a slight hood over the thorax; tibiæ without spines, the fore tibiæ sometimes with one or more terminal claws; the proximal joints of fore tarsi in a few genera with a series of curved claw-like spines; abdomen with dorsal series of crests, one crest at base only, or without crests, the crests on medial segments sometimes very large; Wings usually rather broad and triangular, sometimes long and narrow, the termen usually evenly curved and more or less crenulate, sometimes angled at middle or excised below apex and at tornus where there is in a few genera a scale-tooth; forewing with vein 1*a* weak, not anastomosing with 1*b*, 1*c* absent; 2 from middle of cell or in one or two cases from near its extremity; 3 and 5 from near lower angle, in *Euplexidia* vein 5 almost straight and from just below middle of discocellulars; 6 from upper angle or from just below it; 9 from 10 anastomosing with 8 to form the areole, or in a few genera the areole absent and either 7 or 10 from cell, vein 9 being sometimes absent; 11 from cell. Hindwing with veins 1*a* and 1*b* present, 1*c* absent; 3·4 from lower angle of cell, rarely stalked; 5 obsolescent from or from just below middle of discocellulars; 6,7 from upper angle or slightly stalked; 8 arising free, then bent downwards and touching the cell, then again diverging, in a few genera vein 8 anastomosing with the cell to or to beyond middle.

In the genera without an areole its absence appears to have been always caused by reduction from forms which once possessed it, as it is minute in some of their allies.

In *Eriopus* the males of most of the species have secondary sexual developments of the antennæ, the basal part of the shaft being thickened with an angular projection near its middle, often with scale-teeth or long bristles beyond it, the legs also have greatly developed tufts of hair of various forms.

The larvæ are usually smooth, the warts with one hair; all the prolegs present, the 12th somite with more or less developed dorsal hump.

In *Acronycta* the larvæ sometimes have the hairs spatulate at extremity; many species have tufts of long hair from the warts supplemented by bunches of fine feathery hair and whilst others have numerous secondary hairs from the skin, and large dorsal pencils of hair.

In *Nonagria* and allies the larvæ bore in reeds and are almost without

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hairs, whilst in *Hydræcia* and the allied genera the larvæ bore in the stems and roots of various plants.

The genera *Perigea, Bryophila* and a few others come very close in structure to the sub-family *Erastrianæ* as regards the development of vein 5 of the hindwing, the former resembling *Amyna* and the latter *Lithacodia*, the essential difference in the sub-families being that the larvæ of the *Acronyctinæ* have all the prolegs fully developed, whilst in the *Erastrianæ* the first or first two pairs are more or less aborted.

KEY TO THE GENERA.

A. Forewing without an areole.
- *a.* Forewing with vein 7 stalked with 8·9
  - a^1. Frons with pointed corneous process .. .. *Pachylepis.*
  - b^1. Frons with slight rounded prominence .. *Micrapatetis.*
  - c^1. Frons without prominence.
    - a^2. Forewing with the termen angled at middle... *Neopistria.*
    - b^2. Forewing with the termen evenly curved.
      - a^3. Forewing with vein 9 absent .. .. *Cingalesa.*
      - b^3. Forewing with vein 9 present .. .. *Arboricornis.*
- *b.* Forewing with veins 8, 9, 10 stalked, 7 from cell.
  - a^1. Frons with transverse corneous plate .. *Xantholepis.*
  - b^1. Frons smooth .. .. *Borbotana*

B. Forewing with areole.
- *a.* Frons with long trilobate process and corneous plate below it .. .. *Mudaria.*
- *b.* Frons with truncate corneous prominence with raised edges.
  - a^1. Abdomen with dorsal crests on basal segments.
    - a^2. Proboscis aborted minute.. .. .. *Cetola.*
    - b^2. Proboscis fully developed.. .. .. *Seudyra.*
  - b^1. Abdomen with dorsal crest at base only.
    - a^2. Prothorax with spreading crest.
      - a^3. Hindwing with vein 5 from middle of discocellulars .. .. *Catamecia.*
      - b^3. Hindwing with vein 5 from below middle of discocellulars .. .. .. *Hypoperigea.*
    - b^2. Prothorax without crest.
      - a^3. Frontal prominence large.
        - a^4. Mesothorax with paired crests.. .. *Iambiodes.*
        - b^4. Mesothorax without crests .. .. *Apocalymnia.*
      - b^3. Frontal prominence very small .. .. *Thalatha.*
  - c^1. Abdomen without dorsal crests.
    - a^2. Frons with beak-shaped process from lower edge of prominence .. .. .. *Cytocanis.*

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b^2. Frons with flattened plate from lower edge of prominence grooved in front .. .. *Callœcia.*

c^2. Frons with wedge-shaped process in middle of prominence .. .. *Basilica.*

d^2. Frons without process in middle of prominence.

a^3. Frontal prominence long .. .. *Rabila.*

b^3. Frontal prominence short.

a^4. Palpi with the second joint reaching vertex of head .. .. .. *Stygiathetis.*

b^4. Palpi oblique, short .. .. .. *Dysmilichia.*

c. Frons with pointed prominence.

a^1. Frons with beak-like pointed prominence; palpi with the 2nd joint very broadly sealed .. *Apsarasa.*

b^1. Frons with slight pointed prominence; palpi slender .. .. *Protoseudyra.*

d. Frons with rounded prominence with transverse corneous plate at middle square in front .. *Phragmatiphila.*

e. Frons with rounded prominence with vertical ridge at middle .. .. *Pariambia.*

f. Frons with rounded prominence.

a^1. Abdomen with dorsal crests on basal segments..

a^2. Pro- and metathorax with spreading crests.. *Œderemia.*

b^2. Pro- and metathorax without crests .. *Gœnyota.*

b^1. Abdomen with dorsal crest at base only.

a^2. Prothorax with spreading crest.

a^3. Build stout .. .. *Matopo.*

b^3. Build slender .. .. *Neomilichia.*

b^2. Prothorax without crests .. .. .. *Tycracona.*

c^1. Abdomen without dorsal crests.

a^2. Thorax clothed almost entirely with scales .. *Xylostola.*

b^2. Thorax clothed with hair and hair-like scales .. .. *Arcilasisa.*

g. Frons with transverse ridge .. .. .. *Antha.*

h. Frons smooth and without prominence.

a^1. Proboscis aborted or absent.

a^2. Abdomen with dorsal crest at base only .. *Calamistis.*

b^2. Abdomen without crests.

a^3. Thorax clothed with hair and hair-like scales.

a^4. Forewing with the apex produced and acute; hindwing with veins 3·4 usually stalked, 5 from below middle of disco-cellulars .. .. *Acrapex.*

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b^4. Forewing with the apex not produced; hindwing with veins 3·4 from cell, 5 from middle of discocellulars .. *Sphetta.*

b^3. Thorax clothed with hair only:

a^4. Palpi upturned .. .. .. *Sesamia.*

b^4. Palpi porrect .. .. .. *Simyra.*

b^1. Proboscis fully developed.

a^2. Abdomen with dorsal series of crests.

a^3. Thorax with double ridge-like crest.

a^4. Thorax clothed chiefly with scales.

a^5. Forewing long and narrow, the termen not excised towards tornus.

a^6. Tegulæ produced to a slight dorsal ridge.. .. .. .. *Delta.*

b^6. Tegulæ not produced to a dorsal ridge.

a^7. Forewing very narrow, the termen obliquely curved .. .. *Magusa.*

b^7. Forewing broader, the termen more erect .. .. *Parastichtis.*

b^5. Forewing shorter, the termen excised towards tornus.

a^6. Palpi with the 2nd joint reaching to about vertex of head .. .. *Stenopterygia.*

b^6. Palpi with the 2nd joint reaching to about middle of frons .. *Dipterygia.*

b^4. Thorax clothed with hair and hair-like scales .. .. *Agroperina.*

b^3. Thorax with broad ridge-like crest.. .. *Eurabila.*

c^3. Prothorax with triangular crest.

a^4. Thorax clothed chiefly with scales .. *Lophotyna.*

b^4. Thorax clothed with hair only.

a^5. Forewing with the termen excised below vein 4 .. .. *Trigonophora*

b^5. Forewing with the termen evenly curved.. *Chutapha.*

d^3. Pro-, meso- and meta thorax with large divided crests .. .. *Mania.*

e^3. Pro- and metathorax with divided crests.

a^4. Thorax clothed chiefly with scales.

a^5. Abdomen dorsally flattened .. .. *Checupa.*

b^5. Abdomen not dorsally flattened.

a^6. Forewing with vein 5 nearly straight, from just below middle of discocellulars. *Euplexidia.*

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b^6. Forewing with vein 5 curved, from just above lower angle of cell .. *Trachea.*

b^4. Thorax clothed with hair and hair-like scales .. .. *Paratrachea.*

f^3. Prothorax with spreading crest, metathorax with divided crest .. .. .. *Polyphænis.*

g^2. Pro- and metathorax with spreading crests.

a^4. Thorax clothed chiefly with scales.

a^7. Forewing with slight scale-tooth at tornus.

a^8. Forewing with the termen more or less angled at vein 4, then oblique .. *Eriopus.*

b^8. Forewing with the termen evenly curved, dentate .. .. *Data.*

b^7. Forewing without scale-tooth at tornus.

a^8. Palpi with the 3rd joint porrect .. *Ancara.*

b^8. Palpi with the 3rd joint upturned.

a^7. Palpi with the 3rd joint very long, in male tufted with long hair on inner side and recurved over head .. *Corythurus.*

b^7. Palpi with the 3rd joint shorter.

a^8. Forewing with the cilia strongly dentate towards tornus.. .. *Perigeodes.*

b^8. Forewing with the cilia slightly crenulate.

a^9. Palpi with the 2nd joint reaching vertex of head.

a^{10}. Abdomen with very large crests on 3rd and 4th segments; build slender .. .. .. *Chytonix.*

b^{10}. Abdomen with the crests on median segments equal; build stout .. .. *Perigea.*

b^9. Palpi with the 2nd joint reaching about to middle of frons.

a^{10}. Abdomen with large crest on 3rd segment; build stout .. *Euplexia.*

b^{10}. Abdomen with the crest on medial segments equal.

a^{11}. Forewing with the apex rectangular and somewhat acute .. .. .. *Gortyna.*

b^{11}. Forewing with the apex rounded .. .. .. *Oligia.*

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b^4. Thorax clothed with hair and hair-like scales .. .. *Daseochæta.*

b^3. Prothorax without distinct crests.

a^4. Thorax clothed chiefly with scales.

a^5. Palpi with the 2nd joint reaching to vertex of head, the 3rd long.

a^6. Palpi with the 3rd joint porrect .. *Pseuderastria.*

b^6. Palpi with the 3rd joint upturned .. *Bryophila.*

b^5. Palpi with the 2nd joint reaching about to middle of frons, the 3rd short.

a^6. Forewing with the termen oblique towards tornus .. .. .. *Iambia.*

b^6. Forewing with the termen evenly curved.

a^7. Forewing long and narrow.

a^8. Forewing with the termen erect .. *Calogramma.*

b^8. Forewing with the termen obliquely curved .. .. .. *Prodenia.*

b^7. Forewing short and broad .. .. *Craniophora.*

b^4. Thorax clothed with hair and hair-like scales.

a^5. Mesothorax with paired crests; patagia curled upwards at extremity .. .. *Canna.*

b^5. Mesothorax without crests; patagia not curled upwards at extremity .. .. *Conservula.*

b^3. Thorax without crests .. .. .. *Clethrorasa.*

b^2. Abdomen with dorsal crest at base only.

a^3. Prothorax with sharp triangular crest, metathorax with spreading crest .. .. *Hydrœcia.*

b^3. Prothorax with ridge-like crest, metathorax with spreading crest .. .. .. *Audrolymnia.*

c^3. Thorax with slight dorsal ridge-like crest .. *Pyrrhia.*

d^3. Pro-and metathorax with spreading crests.

a^4. Thorax clothed chiefly with scales.

a^5 Pro-and metathorax with the crests formed of very long spatulate scales.

a^6. Forewing with the apex produced and acute .. .. *Pœcilogramma.*

b^6. Forewing with the apex rounded .. *Opsyra.*

b^5 Prothorax with short spreading crest.

a^6. Palpi upturned, the 2nd joint reaching vertex of head.

a^7. Hindwing with vein 5 from middle of discocellulars .. .. .. *Monodes.*

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b^7. Hindwing with vein 5 from below middle of discocellulars .. *Hadjina.*

b^6. Palpi upturned, the 2nd joint reaching about to middle of frons .. .. *Namangana.*

b^4. Thorax clothed with hair and hair-like scales.

a^5. Palpi with the 3rd joint long and porrect. *Rhynchoplexia.*

b^5. Palpi with the 3rd joint short .. .. *Chiripha.*

c^4. Thorax clothed with hair only .. .. *Lasiplexia.*

e^3. Prothorax without crest, metathorax with spreading crest.

a^4. Palpi with the 2nd joint reaching to vertex of head .. .. *Aucha.*

b^4. Palpi with the 2nd joint reaching about to middle of frons.

a^5. Fore tibiæ broadly fringed with hair; forewing rather broad .. .. .. *Spodoptera.*

b^5. Fore tibiæ slightly fringed with hair; forewing long and narrow .. .. *Laphygma.*

f^3. Thorax without crests.

a^4. Palpi with the 2nd joint reaching to vertex of head .. .. *Chasmina.*

b^4. Palpi with the 2nd joint not reaching above middle of frons, the 3rd short .. .. *Acronycta.*

e^2. Abdomen without dorsal crests.

a^3. Pro and metathorax with spreading crests.

a^4. Forewing long and narrow .. .. *Aræa.*

b^4. Forewing short and broad .. .. *Amphidrina.*

b^3. Prothorax with spreading crest; metathorax without crest.

a^4. Forewing narrow, the margins subparallel .. *Athetis.*

b^4. Forewing broad, triangular .. .. *Arenostola.*

c^3. Thorax without crests.

a^4. Thorax clothed chiefly with scales.

a^5. Forewing long and narrow .. .. *Proxenus.*

b^5. Forewing short and broad.

a^6. Palpi with the 2nd joint reaching to vertex of head slender.

a^7. Palpi flattened against frons .. .. *Callyna.*

b^7. Palpi cylindrical .. .. .. *Elydna.*

b^6. Palpi with the 2nd joint reaching to middle of frons, broadly scaled .. *Nicara.*

b^4. Thorax clothed with hair and hair-like scales.

a^5. Abdomen dorsally flattened. ..

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a^6. Palpi with the 2nd joint fringed with hair in front; hindwing with vein 5 from below middle of discocellulars .. *Pyrois.*

b^6. Palpi smoothly scaled; hindwing with vein 5 from middle of discocellulars .. *Amphipyra*

b^5. Abdomen not dorsally flattened.

a^6. Head and thorax clothed with rough hair and spatulate scales .. .. *Oroplexia.*

b^6. Head and thorax smoothly clothed with Hair and hair-like scales .. .. *Colymnia.*

c^4. Thorax clothed with hair only .. *Hypa Calamia.*

Genus PYROIS.

	Type.
Pyrois, Hübn. Verz., p. 208 (1827)	*cinnamomea.*
Syntomopus, Guen. Ann. Soc. Ent. Fr. vi, p. 223 (1837) ..	*cinnamomea.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and fringed with hair in front, the 3rd short; frons smooth; eyes large, round; antennæ of male minutely ciliated; thorax clothed with hair and hair-like scales and without crests; tibiæ fringed with long hair; abdomen dorsally flattened, clothed with rough hair at base and with lateral fringes of hair towards extremity, but without crests. Forewing with the apex rounded, the termen evenly curved, crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1659. PYROIS ALBICILIA.

Genus AMPHIPYRA.

	Type.
Amphipyra, Ochs Schmett. Eur. iv, p. 70 (1816) non descr; Triet. Schmett. Eur. v. (1), p. 276 (1825)	*tragopoginis.*
Scotophila, Hübn. Verz., p. 208 (1827)	*livida.*
Pyrophila, Steph. Ill. Brit. Ent. Haust. ii, p. 164 (1829) ..	*tragopoginis.*
Phiopyra, Guen. Ann. Soc. Ent. Fr. vii, p. 116 (1838) ..	*pyramidea.*
Pyrophia, Hübn. Tent. ined.	*pyramidea.*

A. Hindwing cupreous red.

a Forewing with the ante and postmedial lines present.

a^1 Forewing with strong dentate dark marks in the interspaces before subterminal line and streaks beyond it .. .. *magna.*

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b^1 Forewing with the dentate marks before subterminal line and streaks beyond it slight .. *pyramidea.*

b Forewing with the ante and postmedial lines absent.

a^1 Hindwing deep cupreous red ; size large.. .. *cupreipennis.*

b^1 Hindwing pale cupreous red ; size moderate .. *livida.*

B. Hindwing not cupreous red .. .. .. *tragopoginis.*

1656. AMPHIPYRA MAGNA.

1655. AMPHIPYRA PYRAMIDEA.

Noctua pyramidea, Linn. Syat. Nat. Ed. x., p. 518 (1758) ; Esp. Schmett. iv., pl. 171, ff. 1-3 ; Hübn. Eur. Schmett. Noct., f. 36 ; Godart. Lèp. Fr. v., p. 136, pl. 56, f. 4 ; Donovan Brit. Tne. vi., pl. 193 ; Steph. Ill. Brit. Ent. Haust. ii., p. 164 ; Staud. Cat. Lep. pal., p. 200.

Amphipyra monolitha, Guen. Noct. ii., p. 414 (1852).

„ *surnia,* Feld. Reis. Nov., pl. 112, f. 17 (1874).

„ *obscura,* Obuth. Et. Ent. v., p. 85 (1889).

„ *obliquilimbata,* Grs. Berl. Ent. Zeit. 1888, p. 352.

1658. AMPHIPYRA CUPREIPENNIS.

1657. AMPHIPYRA LIVIDA.

Noctua livida, Schiff. Wien. Verz., p. 85 (1776) ; Fabr. Mant. Ins. ii, p. 138 (1787) ; Hübn. Eur. Schmett. Noct. f. 38 ; Godart. Lèp. Fr. v., p. 141, pl. 57, f. 1 ; Staud. Cat. Lep. pal. p. 200.

„ *scotophila,* Hübn. Beitr. I. 3-4. Z., p. 34 (1788) ; Esp. Schmett. iv., pl. 170, f. 3 (1791).

Amphipyra corvina, Motsch. Bull. Mox. xxxix., p. 194 (1866).

1659*a*. AMPHIPYRA TRAGOPOGINIS.

Noctua tragopoginis, Linn. Faun. Suec. p. 316 (1761) ; Clerck, Icones. pl. 1., f. 1 ; Esp. Schmett. iv., pl. 170, ff. 1-2 ; Hübn. Eur. Schmett. Noct. f. 40, Godart, Lèp. Fr. v., p. 145, pl. 57, f. 3 ; Steph. Ill. Brit. Ent. Haust. ii., p. 165 ; Smith, Cat. Noct. N. Am., p. 197 ; Staud. Cat. Lep. pal., p. 200.

„ *lucida,* Hübn. Ben. Mag. iii, p. 294 (1767).

Agrotis repressus, Grote, Can. Ent. iii, p. 192 (1871).

Amphipyra turcomana, Staud. Stett. Ent. Zeit., 1888, p. 32.

„ *brayi,* Lambillion, Rev. Ent. Namur, 1907, p. 29.

Head, thorax and abdomen pale glossy red-brown ; palpi fuscous brown ; pectus and legs darker red-brown. Forewing pale glossy red-brown irrorated with a few white scales ; subbasal, antemedial and postmedial lines absent ; orbicular represented by a blackish point, the reniform by two points ; subterminal line represented by a series of white points on the veins, with a dark brown shade before them incurved below vein 3 ; a terminal series of

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slight black lunules; cilia with a dark line near base. Hindwing whitish suffused with pale red-brown, the terminal area darker; a fine waved dark terminal line; cilia red-brown with a fine yellowish line at base; the underside whitish tinged with rufous, the costal and terminal areas to vein 2 red-brown irrorated with whitish, a small dark discoidal spot.

*ab.*1. *turcomana*, paler; forewing leaden grey with a yellowish tinge.

Habitat.—CANADA; U. S. A.; EUROPE; ARMENIA; ASIA MINOR; SYRIA; PERSIA; W. SIBERIA; KASHMIR, Scinde Valley; PUNJAB, Kulu.

Larva. Meyr. Brit. Lep., p. 114; Barrett. Lep. Brit. v, p. 253, pl. 217, f. 2. Green; dorsal, subdorsal and spiracular lines, white or pale yellow, the last sometimes partly edged with black above; head green; somite 11 with slight prominence.

Food plants. *Plantago*, Hawthorn, *Aquilegia*, etc., 5-6.

Genus MANIA.

	Type.
Mormo, Ochs. Schmett. Eur. iv, p. 70 (1816) non descr.	*maura.*
Mania, Treit. Schmett. Eur. v (1), p. 294 (1825)	*maura.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to vertex of head and moderately scaled in front, the 3rd moderate; frons smooth; eyes large, round; antennæ of male ciliated; thorax clothed with scales and hair mixed, the pro, meso and metathorax with divided crests; tibiæ moderately fringed with hair; abdomen clothed with rough hair, with dorsal series of crests and lateral fringes of hair. Forewing very broad, the apex rectangular, the termen evenly curved and the termen and cilia strongly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1766*a*. MANIA OLIVESCARIA.

Genus MAGUSA.

	Type.
Magusa, Walk. xi, 762 (1857)	*orbifera.*
Sasunaga, Moore, P. Z. S., 1881, p. 342	*tenebrosa.*
Callixena, Saalm. Lep. Madag., p. 324 (1891)	*versicolora.*

1771. MAGUSA TENEBROSA.

Genus STENOPTERYGIA.

	Type.
Stenopterygia, Hmpsn. Cat. Lep. Phal. B. M. vii, p. 61 (1908).	*subcurva.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching to vertex of head and moderately scaled, the 3rd short, porrect; frons smooth,

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eyes large, rounded; antennæ of male ciliated; head and thorax clothed; chiefly with scales, the vertex of thorax with broad ridge-like crest; tibiæ moderately scaled; abdomen with dorsal crests on basal segments. Forewing short and narrow, the apex rounded, the termen somewhat excised towards tornus, the inner margin lobed near base and with slight scale tooth at tornus; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with the orbicular and reniform with whitish annuli defined by black .. .. *tenebrosa.*

B. Forewing with the orbicular and reniform indistinctly defined .. .. *subcurva.*

1725*a*. STENOPTERYGIA TENEBROSA, Hmpsn. Cat. Lep. Phal., B. M., vii., p. 61, pl. 109, f. 11 (1908).

♂. Head and base of tegulæ ochreous mixed with black-brown; thorax black-brown with a few ochreous scales; palpi black at sides, pale in front; frons with lateral black bars; pectus and legs ochreous irrorated with brown, the tarsi slightly banded with black; abdomen ochreous dorsally suffused with brown, the crests and anal tuft blackish. Forewing red-brown mostly suffused with black-brown; subbasal line represented by two black striæ from costa filled in with ochreous; a blackish patch above inner margin before the antemedial line, which is double at costa filled in with ochreous, then rather oblique, waved; claviform slightly defined by black; orbicular and reniform with brown centres and slight greyish annuli defined by black; the former rounded, the latter constricted at middle; postmedial line double at costa and filled in with ochreous, bent outwards below costa, then dentate, at vein 3 bent inwards to below angle of cell, some ochreous points beyond it on costa, subterminal line represented by some pale points defined on inner side by black-brown suffusion, excurved below vein 7 and at middle and bent inwards at vein 3; a terminal series of minute white points; cilia black-brown. Hindwing whitish suffused with fuscous brown, especially on terminal area, the veins dark; cilia whitish chequered with brown; the underside whitish irrorated with brown, the terminal areas suffused with brown, a slight discoidal spot.

Habitat.—MADRAS, Godavari District, Rajamahendri. *Exp.* 28 mill.

1725. STENOPTERYGIA SUBCURVA.

Hadena subcurva, Wlk., xi, 592 (1857).

" *postica*, Wlk., xi, 594 (1857).

Xylina calida, Wlk., Journ. Linn. Soc. Zool., vi, p. 195 (1862).

Dipterygia sikkima, Moore, Lep. Atk., p. 105 (1882).

Opigena monostigma, Saalm. Lep. Madag., p. 287, f. 104 (1891).

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Genus DIPTERYGIA.

A. Forewing with whitish patch on tornal area extending to postmedial line.
  a. Forewing with the postmedial line incurved below vein 4.
    a[1]. Forewing with the postmedial line strongly incurved below vein 4 and slightly angled outwards at vein 1 .. .. *indica.*
    b[1]. Forewing with the postmedial line much less incurved below vein 4 not angled outwards at vein 1 .. .. *cristifera.*
  b. Forewing with the postmedial line excurved to vein 3 and angled outwards at vein 2 to near termen.. *umbrifera.*
B. Forewing without whitish patch on tornal area extending to postmedial line .. .. .. *nicea.*

1800. DIPTERYGIA INDICA.
1801. DIPTERYGIA CRISTIFERA.
1804. DIPTERYGIA UMBRIFERA.
2052*a*. DIPTERYGIA NICEA.

Genus PARASTICHTIS.

		Type.
Parastichtis, Hübn. Verz., p. 212 (1827)	.. ..	*hepatica.*
Septis, Hübn. Verz., p. 243 (1827)	.. .. ..	*lithoxylea.*
Xylophasia, Steph., Ill. Brit. Ent. Haust., ii., p. 174 (1829)..		*lithoxylea.*
Xylena, Hübn., Tent. ined. (*nec.* Treit.)	.. ..	*lithoxylea.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and rather broadly fringed with hair, the 3rd short; frons smooth, with tuft of hair; eyes large, round; antennæ of male ciliated; thorax clothed with hair and scales mixed, a divided dorsal ridge-like crest, larger on pro and metathorax; tibiæ fringed with hair; abdomen with dorsal series of crests and lateral fringes of hair. Forewing rather long and narrow, the apex rounded, the termen crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with more or less prominent dark streak below base of cell.
  a. Forewing with dark streak in submedian interspace between ante and postmedial lines.
    a[1]. Forewing with the orbicular large, oblique elliptical .. .. *strigidisca.*
    b[1]. Forewing with the orbicular small, round .. *flavistigm.*

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b. Forewing without dark streak in submedial interspace between ante and postmedian lines.

a^1. Forewing with the orbicular narrow and rounded.

a^2. Forewing without whitish lunule on outer edge of reniform .. .. .. *sodalis.*

b^2. Forewing with small whitish lunule on outer edge of reniform .. .. .. *funerea.*

b^1. Forewing with the orbicular rounded.. .. *boopis.*

B. Forewing without dark streak below base of cell.

a. Forewing with large whitish lunule on outer edge of reniform.. .. .. *leucostigma.*

b. Forewing with white points on outer edge of reniform .. .. *purpurina.*

1710*a*. PARASTICHTIS STRIGIDISCA.

Apamea strigidisca, Moore, P. Z. S., 1881, p. 346, pl. 38, f. 9. Hmpsn., Cat. Lep. Phal. B. M., vii, p. 92, pl. 110, f. 3.

♀. Head and thorax greyish tinged with rufous and mixed with some dark-brown and black; tarsi blackish with pale rings; abdomen greyish suffused with brown. Forewing greyish ochreous and rufous, the basal half suffused with black except the inner margin, the terminal area blackish except at apex; subbasal line double, black filled in with rufous, waved, from costa to submedian fold; antemedial line double, indistinctly filled in with rufous, angled outwards below costa, oblique to submedian fold, then angled inwards on vein 1; claviform large, indistinctly defined by black; orbicular rufous defined by black at sides, oblique elliptical; reniform ochreous white defined by black on inner side and below and slightly by brown on outer, somewhat angled inwards on median nervure; and with irregular outer edge; an indistinct medial line, oblique from costa to below cell; the area beyond the reniform rufous to postmedial line which is blackish defined on outer side by ochreous, slightly bent outwards below costa then very minutely waved, oblique to vein 5, inwardly oblique to below angle of cell and sinuous to inner margin; postmedial area ochreous suffused with rufous and brown on costal half, the veins with slight dark streaks, the costa with pale points; subterminal line ochreous defined on inner side by brown suffusion, angled outwards to near termen at veins 7, 4·3; a terminal series of small black lunules; cilia blackish with a fine ochreous line at base. Hindwing fuscous brown, the cilia ochreous white with a slight dark line through them. Underside of both wings ochreous, the costal areas tinged with rufous to postmedial line which is nearly straight on forewing, minutely waved on hindwing; a broad fuscous subterminal band, forewing with small discoidal lunule, hindwing with small annules.

Habitat.—SIKHIM. *Exp.* ♂ 42, ♀ 50 mill.

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1717. PARASTICHTIS FLAVISTIGMA.

Xylophasia flavistigma, Moore, P. Z. S., 1867, p. 50; Hmpsn., Cat. Lep. Phal. B. M., vii., p. 93, pl. 110, f. 5.

Apamea basalis, Moore, P. Z. S. 1881, p. 346.

„ *denticulosa*, Moore, Lep. Atk., p. 109, pl. 4, f. 13 (1882).

1717. PARASTICHTIS SODALIS.

Xylophasia sodalis, Butl, A. M. N. H. (5) i., p. 83 (1878); id. Ill., Het. B. M., ii., p. 24, pl. 29, f. 2.

Apamea obliquiorbis, Moore, Lep. Atk., p. 109 (1882).

1710*b*. PARASTICHTIS FUNEREA.

Hadena funerea, Hein. Schmett. Deutsch., I., p. 828 (1859); Snell Tijd. v., Ent. xi., p. 299, pl. 12, f. 1; Hofm. Gr. Schmett. ed. ii., pl. 39, f. 27; Staud. Cat. Lep. pal p. 191.

Head and thorax black mixed with purplish red and some grey, frons with lateral black basers; tegulæ with black medial line; patagia with black line near upper edge; tarsi black ringed with pinkish; abdomen fuscous, the lateral fringes and sides of anal tuft purplish, the ventral surface irrorated with purplish. Forewing fuscous black more or less tinged with purplish; sub-basal line represented by double oblique black striæ from costa; a sinuous black streak in base of submedian fold and an oblique streak above inner margin near base; antemedial line indistinctly double, angled outwards below costa, then oblique and slightly waved, retracted to inner margin; clavifrom narrow or small, defined by black; orbicular very oblique elliptical, defined by black; reniform defined by black, with a little white in centre and some white points on upper and outer edges and slight black streaks beyond it in the inter spaces; an indistinct curved minutely waved medial line; postmedial line double at costa, bent outwards below costa, then indistinct, minutely dentate, excurved to vein 4, then incurved, some white points beyond it on costa; subterminal line indistinct, reddish, defined on inner side by faint dentate dark marks, excurved below vein 7 and at middle, the area beyond it rather darker except at apex; a terminal series of slight black points; a fine pale line at base of cilia. Hindwing fuscous with a slight greyish tinge; cilia pale brown at base with fuscous line at middle and whitish tips; the underside whitish irrorated with fuscous, the costal area tinged with purplish, the terminal area suffused with fuscous, a black discoidal spot and curved postmedial line.

Habitat.—HOLLAND; N. W. GERMANY; E. SIBERIA; JAPAN; C. CHINA; W. CHINA; KASHMIR, Narkunda; PUNJAB, Dharmsála; ASSAM, Khásis.

Exp. 40-48 mill.

Larva, Kirby. Butt. and Moths Eur., p. 237; Hffm., Raup., p. 96.

Palerosy grey to reddish brown; dorsal line ochreous whitish, dark-edged; subdorsal line pale; spiracular line broad, pale greyish ochreous

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dark-edged above; head reddish brown or dark brown; thoracic plate blackish with whitish lines. Food plant: *Grasses*.

1710c. PARASTICHTIS BOOPIS, Hmpsn., Cat. Lep. Phal. B. M., vii., p. 102, pl. 110, f. 12 (1908).

Head and thorax greyish tinged with red-brown and slightly irrorated with black; palpi blackish at sides; frons with lateral black bars; tegulæ with black medial line and black line on prothorax; tarsi black with pale rings; abdomen grey-brown, the crests tipped with black, the anal tuft and ventral surface rufous. Forewing red-brown slightly irrorated with dark brown, the costal half on antemedial and medial areas suffused with dark brown, a dark brown costal patch on postmedial area and the terminal area dark brown except at apex; subbasal line double, waved, from costa to submedian fold; a slight black streak below base of cell and another above inner margin before the antemedial line, which is indistinct, double, oblique, waved; claviform moderate, defined by black; orbicular rufous defined by black, round or oblique elliptical; reniform defined by black on inner side and with large grey lunule on outer edge defined by black on inner side; an indistinct medial line oblique from costa to below the cell; postmedial line indistinctly double, slightly bent outwards below costa, then minutely dentate and produced to black streaks with grey points on them on the veins, excurved to vein 4, then incurved, some pale points beyond it on the dark costal patch; subterminal line very indistinct, pale, excurved below vein 7 and at middle and angled inwards at discal and submedian folds; a fine waved dark terminal line; cilia chequered greyish and fuscous, with punctiform rufous line at base. Hindwing fuscous, the cilia pale rufous; the underside pale rufous irrorated with brown, a black discoidal spot, sinuous postmedial line and traces of diffused subterminal line.

Habitat.—W. CHINA; PUNJAB, Kulu, Sultanpur, Dharmsàla; ASSAM Khàsis. *Exp.* 40-44 mill.

1764. PARASTICHTIS LEUCOSTIGMA.

Xylophasia leucostigma, Moore, P. Z. S., 1867, p. 51.

Hadena constellata, Moore, Lep. Atk., p. 130, pl. iv., f. 21 (1882).

Euplexia oxydata, Hmpsn., J. Bomb. N. H. Soc., xiv., p. 199 (1902).

1717b. PARASTICHTIS PURPURINA, Hmpsn., J. Bomb. N. H. Soc., xiv., p. 199, (1902); *id.* Cat. Lep. Phal. B. M., vii., p. 106, pl. 110, f. 17.

Genus EURABILA.

Type.

Eurabila, Butl., Ill. Het. B. M., vii., p. 39 (1889) .. .. *lignea*.

Proboscis fully developed; palpi obliquely upturned, moderately scaled, the 2nd joint reaching about to middle of frons, the 3rd short; frons smooth; eyes large, round; antennæ of male ciliated and somewhat laminate; head

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and thorax clothed chiefly with scales, tegulæ produced to a slight dorsal ridge, thorax with single broad ridge-like dorsal crest; tibiæ moderately fringed with hair; abdomen with complete series of dorsal crests, the crests of 3rd and 4th segments large, some rough hair at base and lateral fringes of hair. Forewing triangular, the apex rounded, the termen crenulate; veins 3 and 5 from angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper ngle; 8 anastomosing with the cell near base only.

1718. EURABILA LIGNEA.

Genus EUPLEXIDIA.

	Type.
Euplexidia, Hmpsn., Moths. Ind., iv., p. 461 (1896); Swinh., A. M. N. H., (6) xix., p. 165 (1897)	*noctuiformis.*

314*b*. EUPLEXIDIA NOCTUIFORMIS.

Genus CHECUPA.

	Type.
Checupa, Moore, P. Z. S., 1867, p. 60	*fortissima.*

Proboscis fully developed; palpi upturned, the 2nd jont thick, hardly reaching to middle of frons, and smoothly scaled, the 3rd short; frons smooth; eyes large, round; antennæ of male ciliated; thorax clothed chiefly with scales, the pro- and metathorax with small divided crests; tibiæ thickly fringed with long hair in male; abdomen dorsally flattened and with small crests on two basal segments and lateral fringes of hair, the male with large ventral tufts of hair from base, and paired lateral tufts from penultimate segment. Forewing very long and narrow, the apex rounded, the termen obliquely curved and crenulate, the cell clothed with long hair on underside; veins 3 and 5 from near angle of cell; 6 from below upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only; male with some long hair on upperside in cell and on inner area, on underside with fringes of hair from basal half of costa, median nervure and base of vein 4, and submedian fold.

1782. CHECUPA FORTISSIMA.

(To be continued.)

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THE PALMS OF BRITISH INDIA AND CEYLON INDIGENOUS AND INTRODUCED.

BY

E. BLATTER, S. J.

PART III.

(With Plates VI, VII, VIII, IX, X & XI and Map B.)

(Continued from page 360 of this Volume.)

PHŒNIX HUMILIS, Royle, Ill. 394, 397, 399; Becc. Males. III, 347 373; Hooker Fl. Brit., Ind. VI. 426; Brandis Ind. Trees 645.

DESCRIPTION.—Stems short tufted (and bulbiform?), rarely elongate. Leaves sub-glaucous; leaflets scattered interruptedly fascicled. Fruiting spadix long-peduncled; branches spreading, rather slender. Fruit oblong, pericarp thin.

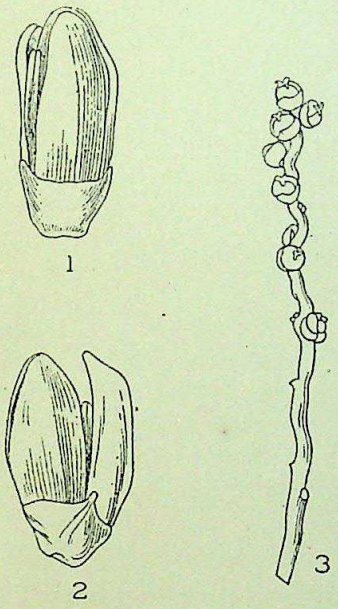

FIG. 1.
Phœnix humilis.
1 and 2 male flowers (× 4).
3. Branch of female spadix with flowers not yet quite open (nat. size). (After Beccari).

HABITAT.—Hilly districts of India, from Kumaon eastwards to Burma, and southwards to Malabar.—China, Cochin-China.

This species requires further examination. In the meantime we give the Indian varieties referred to as *P. humilis* by Beccari, and follow Hooker in treating Beccari's variety γ, *robusta*, as a separate species.

VAR. α. *TYPICA*, Becc. Males. III. 347, 379, t. 44, and II. f. 22-24; Hook. Fl. Brit. Ind. VI. 427—*P. humilis*, Royle, l. c.—*P. ouseleyana*, Griff. in Calc. Journ. Nat. Hist. V. 347; Palms. Brit. Ind. 139.

NAMES.—Thakal (Kumaon); Khajur (Hind.).

DESCRIPTION.—Stem short or moderately long; leaflets elongate, pale green, in usually remote fascicles. Fruiting peduncle usually very long, fruit rather long, groove of seed very short.

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Griffith gives the following description of *P. ouseleyana* "Bulbous stems ovate, imbricated conspicuously with the hardened scale-like bases of the petioles, about a foot in length and six inches in diameter. The rete consists of a few rigid fibres. Leaves 2½ or 3 feet long. Pinnules entirely conduplicate, about 1 foot long, from the conduplication 2, or 2½ lines broad, subulate-acuminate; lowermost degenerated into short spines. Male spadices about 1 foot long, the ends of the uppermost spikes rather longer than the bivalved carinate spathe. Female spadices 2, or 2½ feet long with a few short flexuose spikes towards the apex, much longer than the spathes, which appear to be about a span long. Peduncle of both spadices much flattened."

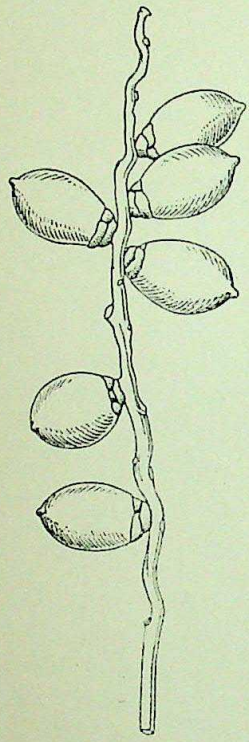

FIG. 2.
Branch with ripe fruits of *Phœnix humilis* (nat. size). (After Beccari)

HABITAT.—Outer Himalaya, 1-5,000 feet, from Kumaon east-wards; Assam; Khasia Hills; Central India; Chota Nagpur.

VAR. β. LOURIERII, Becc. Males. III. 348, 379, t. 44, II. f. 16, 17; Hook. Fl. Brit. Ind. VI. 427.—*P. loureirii*, Kunth Enum. III. 257—*P. pusilla*, Lour. Fl. Cochinch. 614 (non Gaertn.)—*P. roebelinii*, O'Brien, in Gard. Chron. (1889) II. 475, 758, fig. 68.

DESCRIPTION.—Stem short, or very short. Leaflets subglaucous, often approximate, mostly falciform. Fruiting peduncle elongate. Fruit ovoid.

HABITAT.—Assam; Khasia Hills; Burma; Munipore; Cochin-China.

VAR. δ. PEDUNCULATA, Becc. Males. III. 379, 387, t. 44, II. 13-15, 18-21, 25-27; Hook. Fl. Brit. Ind. VI. 427; Woodr. in Journ. Bomb. Nat. Hist. Soc. XII, 526; Talb. Trees Bomb. ed. 2, p. 342. Cooke, Fl. Bomb. Pres. II. 802.—*P. pedunculata*, Griff. Palms Brit. Ind. 139.—*P. acaulis*, Miq. Pl. Hohen. Nilg. n. 1243.

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DESCRIPTION.—Soboliferous; stem ½-10 feet high, 9 inches in diameter, densely covered with the bases of the fallen petioles, more or less spirally arranged; root suckers developing when the primary stem has been burnt or injured. Leaves 4-8 feet long; leaflets pliable, 10-20 inches long, ⅓-½ inch broad, fasciculate, more or less quadrifarious, the uppermost sometimes confluent, base not thickened and not decurrent into the common petiole; petioles 1 inch broad at the base, with spines reaching 3 inches long. Spathe about 8 inches long, with fringed margin. Spadix scarcely exceeding the spathe. Fruiting spadix 3-4 feet long, the compressed peduncle much elongate. Fruit ½ inch long, at first orange then black.

HABITAT.—Western Ghats, from the Konkan southwards, ascending to about 6,000 feet on the Nilghiris; common on the Ghats of N. Kanara.

FLOWERS from December to February.

USES.—The fruit is edible. The leaflets are made into mats commonly used for covering bales of red pepper in the Dharwar district.

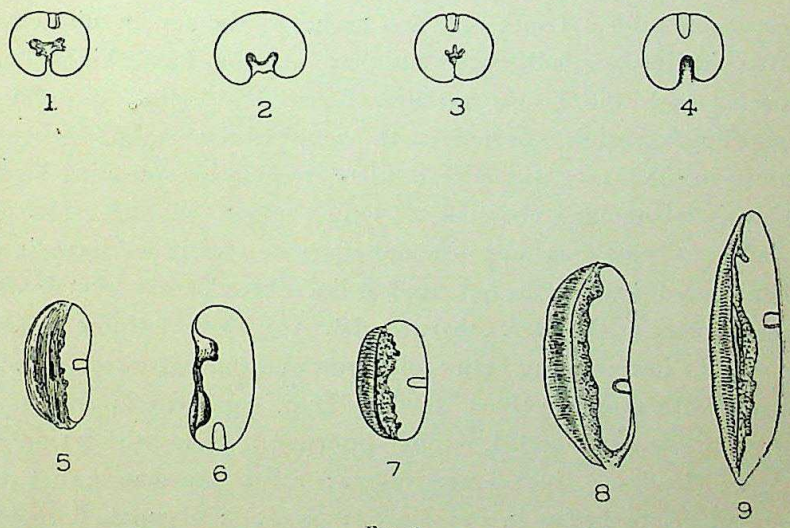

FIG. 3.

Transverse section of seed of—
1. *Phœnix sylvestris* (Nat. size).
2. *Phœnix paludosa* (2×).
3. *Phœnix canariensis* (Nat. size).
4. *Phœnix reclinata* (2×).

Longitudinal section of seed of—
5. *Phœnix sylvestris* (Nat. size).
6. *Phœnix paludosa* (2×).
7. *Phœnix canariensis* (Nat. size).
8. *Phœnix humilis* (2×).
9. *Phœnix dactylifera* (Nat. size).
(After Beccari).

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ILLUSTRATIONS.—Plate VI. A. The photograph supplied by Major Gage, shows five old specimens of *Phœnix humilis, var. typica.* The short stems are conspicuously covered with the spirally arranged bases of the petioles.

Plate VI. B. The photograph, supplied by Mr. Roscoe Allen, shows *Phœnix humilis, var. pedunculata.* We selected this photograph (in preference to others, which showed the leaves much better) on account of the long fruiting spadices, which come out distinctly in our picture.

PHŒNIX PALUDOSA, Roxb. Hort. Beng. 75; Fl. Ind. III. 789; Mart. Hist. Nat. Palm. III. 272, 320, t. 136; Kunth Enum. III. 256; Wall. Cat. 8603; Griff. in Calc. Journ. Nat Hist. V. 353; Palms Brit. Ind. 144, t. 229 A. B; Kurz in Journ. As. Soc. Beng. XLIII. II. 202; For. Fl. II. 536; Brandis, For. Fl. 556; Ind. Trees 646; Gamble Man. Ind. Timb. 419; Hook. Fl. Brit. Ind. VI. 427.—*P. siamensis* Miq. Palm. Archip. Ind. 14.

NAMES.—Hintal, Golpatta (Beng.); Thinboung (Burm.); Giruka tati (Tel.); Hintala (Sanscr.); Dangsa (in Penang).

DESCRIPTION.—Subarboreous, gregarious, forming elegant impenetrable tufts. Trunk 8-25 feet high, 3½ inches in diameter, often inclined, soboliferous, annulate at the base, higher up covered with the brown petioles. Leaves 8-10 feet, gracefully spreading. Petiole covered with scurf, brownish-glaucescent, armed in the lower three feet with irregularly spreading hard, brown, triangular, channelled, long spines, sheath fibrous. Leaflets 1-2 feet long, opposite and alternate, bifarious, spreading, then curved downwards, not rigid, 8 lines broad, very acuminate, conduplicate at the base, otherwise flat, whitish or farinose underneath, the lowest being both the longest and the narrowest. Male spadix with peduncle about 1½ foot long, compressed; spathe as long, coriaceous, 2-keeled, orange-brownish; keels with irregular edges; flowers ¼ inch long, yellow; calyx cup-shaped, not as regularly 3-toothed as in *P. sylvestris*; petals 3; filaments 6, short. Female spadix about 1½ foot long; flowers subglobose, greenish; calyx as in the male; petals roundish, concave; staminodes 6. Carpels 3, free; styles recurved. Fruiting spadix 3-4 feet long, erect, yellowish orange, with branches at the apex; spikes of the

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same colour, with thickened bases, about a foot long, nodding, sometimes branched. Fruit sessile on thickened knobs, first yellowish, then red, and finally black purple, ½ inch long, 3-4 lines wide, mucronate, with the more or less split perianth at the base. Seed ovoid, compressed, rather deeply furrowed on one side up to the middle, and indistinctly so on the opposite side. Embryo basilar.

HABITAT.—Aestuarial shores from Bengal to Burma and the Andaman Islands; forms a considerable portion of the impenetrable woods which cover the Sunderbuns; along the Salwin, between Amherst and Moulmein; Penang; Siam; Cochin China

FLOWERS.—In March and April; fruit ripens from June to December.

USES.—The leaves are used in the Sunderbuns to make ropes for tying boats and logs, and also for thatching.

The stems of the smaller trees are used as walking sticks; the longer ones serve for rafters.

The natives believe that snakes get out of the way of any person having such a stick.

CULTIVATION.—This palm is worth cultivation on account of its elegance, and well adapted for bank scenery.

ILLUSTRATION.—Plate VII. The photograph, supplied by Major Gage, shows a dense tuft of *Phœnix paludosa*. This species is not likely to be confounded with any other. Its habit is less genuine than in the others. In the big leaf in the foreground of the picture the bifarious arrangement of the solitary and downwards curved leaflets can be distinctly seen.

PHŒNIX ROBUSTA, Hook, f., Fl. Brit. Ind., VI, 427; Woodrow in Journ. Bomb. Nat. Hist. Soc., XII, 526; Rec. Bot. Surv. Ind., I, part 6,94; Brandis, Ind. Trees, 645; Cooke, Fl. Pres. Bomb., II, 801.—*Phœnix humilis*, Royle, *var. robusta*, Becc. Males. III, 379.

Name: Shelu (Mar.).

DESCRIPTION.—Trunk 15-20 feet high, about 15 inches in diameter, closely clothed and appearing tessellated from the spirally arranged sheaths of fallen leaves. Leaves 3-5 feet long, glabrous, shining, shorter, broader, thinner, and smoother than

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those of *Phœnix sylvestris;* leaflets in fasicles, quadrifarious, strongly conduplicate. Spathe fringed with brown wool on the keel. Fruiting peduncle 2 feet long. Ripe fruit brown.—Materials are wanting for a complete diagnosis.

HABITAT.—On Parasnath in Behar; Deccan; gregarious on the top of trap hills near Bhorkas; Western Ghats: Nandgaon.

FLOWERS in February.

USES.—Woodrow says that in the country near Bhorkas, where it is locally abundant, it is used largely for the manufacture of date-matting.

* * Introduced Species.

PHŒNIX DACTYLIFERA, L. Hort. Cliff., 482; Spec. Pl. ed. Willd., IV. 730.—*P. excelsior*, Cavan. Icon. et Descr. Pl. II. 13.

NAMES.—The Edible Date; Khajur, Khaji (Hind.); Khajur (Beng.); Kasser (Bhot.); Khajur, Khaji (Panj.); Mach (N. Baluch.); Kajura (Pushtu); Karmah (Turki.); Pind Chirdi, Kurma, Tar, Khaji (Sind); Khajur (Bomb.); Kharjur (Mar.); Khajur, Karek (Guz.); Perich-chankay (Tam.); Kharjurapu, Perita, Mudda Kharjurapu (Tel.); Kharjura (Kan.); Swonpalwon (Burm.); Indi (Sing.); Pindakharjura (Sans.).

DESCRIPTION.—A tall tree, attaining 100-120 feet; trunk covered with the persistent bases of petioles; the foot often surrounded by a dense mass of root suckers which is never the case in *P. sylvestris*. Leaves grey, longer than those of *P. sylvestris*; pinnæ 8-16 inches long, regularly distichous, forming a very acute angle with the petiole, often approximate in twos or threes on the same side of the petiole; petiole grey, laterally compressed, almost flat. Male panicles white, compact, 6-9 inches long, on a short peduncle, flowers $\frac{1}{4}$-$\frac{1}{3}$ inch long, sweet scented; sheaths outside with rusty down. Peduncles of female inflorescence $\frac{1}{3}$-$\frac{1}{2}$ inch broad, sometimes broader below, spikes 12-24 inches long. Fruit oblong, 1-3 inches long, generally reddish or yellowish-brown when ripe, pulp fleshy sweet; numerous varieties are cultivated, differing in colour, shape, and taste of the fruit. Seed cylindric,

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with a longitudinal furrow in front, and a small cylindric embryo in the middle of the rounded back. When the seed germinates, that end of the embryo which remains enclosed in the albumen enlarges at the expense of the albumen, the horny substance of which is converted into sugar and other soluble substances, which are absorbed by the embryo furnishing the substance for its early growth. The process is analogous to the conversion into sugar of the starch which fills the cells of the albumen of wheat, maize, rice and bamboos, during germination, with this difference, that the starch forms the contents of the cells, whereas, in the stone of the date, the walls of the cells themselves furnish the food of the growing embryo.

HABITAT.—In India the date palm is cultivated and self-sown in Sind and in the Southern Panjab, particularly near Multan and Muzaffargarh, also in the Sind Sagar Doab and trans-Indus territory. Near Dhera Ghazi Khan, date palms are very numerous on a strip 10-12 miles long from north to south. A few trees are found planted at many places in the Eastern Panjab, also at Saharanpur, and here and there in the Ganges Doab and Bandelkhand. It is also grown in the Deccan and Gujarat, but does not thrive in Bengal. The tree was probably introduced into India at the time of the first Mahomedan conquest of Sind, at the beginning of the eighth century. It thrives luxuriantly in the arid rainless regions of North Africa and West Asia, where it is exposed to extreme heat in the day-time, and not uncommonly to frost at night, but it requires a certain amount of moisture in the soil. In Europe it is cultivated in Spain, where it was introduced by the Arabs, and where it produces eatable fruit; also on the Hyères islands, the Riviera near Nice, St. Remo, and Genoa, where it attains its northernmost point at 44° 30′ N. L. There is a wood of Date Palms at Bordighera near St. Remo, said to contain over 4,000 stems cultivated mainly to yield palms for Palm Sunday at Rome. In South Italy, Sicily, and Greece, the tree is not uncommon, but the fruit is small and poor.

FLOWERS in March and April; fruit ripens in August, September, and October.

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HISTORY.—We do not feel competent to write a better account of the history of the Date Palm than DeCandalle in his "Origin of Cultivated Plants." His arguments are the following :—

"The Date Palm has existed from prehistoric times in the warm dry zone, which extends from Senegal to the basin of the Indus, principally between parallels 15 and 30. It is seen here and there further to the north, by reason of exceptional circumstances and of the aim which is proposed in its cultivation. Far beyond the limit within which the fruit ripens every year, there is a zone in which they ripen ill or seldom, and a further region within which the tree can live, but without fruiting or even flowering. These limits have been traced by de Martius, Carl Ritter and myself.

"As regards the Date Palm we can hardly rely on the more or less proved existence of really wild indigenous individuals. Dates are easily transported; the stones germinate when sown in damp soil near the source of a river, and even in the fissures of rocks. The inhabitants of oases have planted or sown Date Palms in favourable localities where the species perhaps existed before man, and when the traveller comes across isolated trees at a distance from dwellings, he cannot know that they did not spring from stones thrown away by caravans. Historical and philological data are of more value here, though doubtless from the antiquity of cultivation they can only establish probabilities.

"From Egyptian and Assyrian remains, as well as from tradition and the most ancient writings, we find that the Date Palm grew in abundance in the region lying between the Euphrates and the Nile. Egyptian monuments contain fruits and drawings of the tree. Herodotus in a more recent age (fifth century before Christ), mentions the wood of the Date Palms of Babylonia, and still later Strabo used similar expressions about those of Arabia, whence it seems that the species was commoner than it is now, and more in the condition of a natural forest tree. On the other hand, Carl Ritter makes the ingenious observation that the earliest Hebrew books do not speak of the Date Palm as producing a fruit valued as a food for man. David, about one thousand years before Christ, and about seven centuries after Moses, does not mention the

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Date Palm in his list of trees to be planted in his gardens. It is true that except at Jericho dates seldom ripen in Palestine. Later, Herodotus says of the Babylonian Date Palms that only the greater part produced good fruit which was used for food. This seems to indicate the beginning of a cultivation perfected by the selection of varieties and of the transport of male flowers into the middle of the branches of female trees, but it perhaps signifies also that Herodotus was ignorant of the existence of the male plant.

"To the west of Egypt the Date Palm had probably existed for centuries or for thousands of years when Herodotus mentioned them. He speaks of Libya. There is no historical record with respect to the oases in the Sahara, but Pliny mentions the Date Palm in the Canaries.

"The names of the species bear witness to its great antiquity both in Asia and in Africa, seeing they are numerous and very different. The Hebrews called the Date Palm tamar, and the ancient Egyptians beg. The complete difference between these words, both very ancient, shows that these peoples found the species indigenous and perhaps already named in Western Asia and in Egypt. The number of Persian, Arabic, and Berber names is incredible. Some are derived from the Hebrew word, others from unknown sources. They often apply to different states of the fruit, or to different cultivated varieties, which again shows ancient cultivation in different countries. Webb and Berthelot have not discovered a name for the Date Palm in the language of the Guanchos, and this is much to be regretted. The Greek name phœnix refers simply to Phœnicia, and the Phœnicians, possessors of the Date Palm. The names dactylus and date are derivations of dachel in a Hebrew dialect. No Sanskrit name is known, whence it may be inferred that the plantations of the Date Palm in Western India are not very ancient. The Indian climate does not suit the species. The Hindustani name kharma is borrowed from the Persian.

"Further to the East the Date Palm remained long unknown. The Chinese received it from Persia, in the third century of our era, and its cultivation was resumed at different times, but they have now abandoned it. As a rule, beyond the arid region which

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lies between the Euphrates and the south of the Atlas and the Canaries, the Date Palm has not succeeded in similar latitudes, or at least it has not become an important culture. It might be grown with success in Australia and at the Cape, but the Europeans who have colonized these regions are not satisfied, like the Arabs, with figs and dates for their staple food. I think, in fine, that in times anterior to the earliest Egyptian dynasties the Date Palm already existed, wild or sown here and there by wandering tribes, in a narrow zone extending from the Euphrates to the Canaries, and that its cultivation began later as far as the north-west of India on the one hand and the Cape de Verde Islands on the other, so that the natural area has remained very nearly the same for about five thousand years. What it was previously, palæontological discoveries may one day reveal."

USES.—The importance of the Date Palm is very extensive. A considerable part of the inhabitants of Egypt, Arabia and Persia subsist almost entirely on its fruit. They make a conserve of it with sugar, and even grind the hard stones in their hand-mills for their camels. "All Fezzan and half of Tripolitania satisfy most of their wants with the products of it. The huts of the poorer classes are entirely made of its leaves, and the more substantial habitations of the rich chiefly consist of the same material; every door, every post is made of its wood, and the ceilings of the rooms are formed by its trunks. The footstalks furnish the most common fuel, and they are often brought on men's backs from a distance of six to eight miles. The fruit is the common food of both man and beast: camels, horses, dogs, all eat dates. Even the stones are soaked in water, and when they have thus become soft are given to the cattle. The number of the Date Palms cultivated is enormous. When Abdel-Gelil besieged Suckna, in 1824, he cut down no fewer than 43,000 trees, to compel the town to surrender; nevertheless there are still at least 70,000 left. Their produce is comparatively small, a hundred full-grown trees yielding about forty cwts. of dates. These, after having been gathered, are dried in the sun, and quite hard buried in the sand. They may thus be preserved about two years, but generally after eighteen months they are attacked by worms, and in the beginning of the third year nothing remains of

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them, save the stones. As an every day food, dates are considered very heating, in consequence of which they are not much used on journeys, as causing great thirst. The most relishing and wholesome way to eat them is, when made into a paste, mixed with barley. When the heart of the leaves has been cut out a sweet thickish fluid collects at that cavity, called lagbi, which is very, refreshing and slightly purgative. A few hours afterwards the fluid begins to ferment, becomes acid and very intoxicating. From the ripe fruit a kind of treacle is prepared, used especially for coating leather bags or pipes to render them tight."—(Vogel). In the Punjab dates form an important article of food in certain districts, and they are sold in the bazaar under different names, according to quality and the mode of preparation. Thus, according to Coldstream, the most esteemed kind is called Chirni in the Muzaffargarh district; this is the date of the best palms, split up in the middle and dried in the sun. The second best is called Pind; it is eaten as it comes from the tree, without further preparation. The least esteemed kind is Bugri, taken from inferior trees and boiled in oil and water. The Punjab dates are smaller than those of Arabia and Egypt, but they are very good, and particularly so when there has been little or no late rain. When beginning to get ripe, a piece of matting is often put over the cluster of dates to prevent birds eating them. The kernels are deemed medicinal. The large succulent head, cut from among the mass of leaves, is eaten (Gaddah, Gari, Galli). The tree yields a gum, called Hukm Chil. Attempts have been made, but without much success, to tap the Date Palms of Multan for their sugary sap.

The wood of the Date Palm is lighter than that of Cocos or Borassus. The cellular tissue is soft; the vascular bundles generally show, on a horizontal section, an oval shape with two distinct large pores at one end, the hard woody portion gray; on a vertical section they appear as shining narrow lines. The wood of male trees and of trees past bearing is used for building, water-channels, bridges, and various other purposes.

Of the leaves, mats and the bag-like baskets universally used in the whole Mediterranean region, and in other countries, are made.

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In the Punjab mats and fans are made of the leaves; they are called Butra or Pattra in Muzaffargarh, and Khushab in Shahpur. The leaf stalks make excellent light walking-sticks, split up they furnish material for crates and baskets; the fibrous network, which forms the sheathing base of the petiole, is called Kabal or Khajur-ka-bokla in Muzaffargarh, pack-saddles for oxen are made of it, and the fibre separated is made into ropes.

The sap is obtained by cutting off the head of the palm and scooping out a hollow in the top of the stem, where, in ascending, it lodges itself. Three or four quarts of sap may be obtained daily from a single palm, for ten days or a fortnight, after which the quantity lessens, until, at the end of six weeks or two months, the stem is exhausted, becomes dry, and is used for firewood. This liquor is sweetish when first collected and may be drunk as a mild beverage, but fermentation soon takes place, and a spirit is produced, which is distilled, and forms one of the kinds of Arrack, or spirit of eastern countries. Such being the importance and multiplied uses of the Date Palm, it is not surprising that in an arid and barren country it should form so prominent a subject of allusion and description in the works of Arab authors, and that it should be said to have 300 names in their language. Many of these are however applied to different parts of the plant, as well as to these at different ages. The Mahomedans are very proud of the Date Palm, and say that it refuses to grow well in any country which is not consecrated to Islam. There are many varieties, all exactly alike in appearance, but differing in the fruit. In Baghdad alone there are 40 or 50 well-known kinds of dates, some of them bearing romantic names, such as "lady's fingers," and "pretty maiden's eyes." In the Basra district there are even more varieties, as well as a vastly greater number of trees. The palms between Fao at the mouth of the river and Gurna and at the junction of the Tigris and Euphrates are numbered in millions, and each brings in an average income of Rs. 3 or 4 a year.

"The exports of Indian dates are not as yet important; they have averaged about 130 cwt., valued at Rs. 1,215, during the four years ending 1904-5, but in 1905-6 were only 34 cwt., valued at Rs. 364, and in 1906-7, 14 cwt., valued at Rs. 254. The

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re-exports, during the same period, were as follows:—1900-1, 34,444 cwt., valued at Rs. 1,69,263; 1901-2, 27,632 cwt., valued at Rs. 1,41,939; 1902-3, 47,041 cwt., valued at Rs. 2,18,455; 1903-4, 25,330 cwt., valued at Rs. 1,27,277; 1904-5, 22,260 cwt., valued at Rs. 1,24,684; 1905-6, 23,542 cwt., valued at Rs. 1,31,373; and in 1906-7, 27,945 cwt., valued at Rs. 1,69,639.

"The foreign supplies, on the other hand, are large and important; in 1900-1 they came to 871,272 cwt., valued at Rs. 41,94,972; 1901-2, 901,006 cwt., valued at Rs. 42,11,091; 1902-3, 633,390 cwt., valued at Rs. 31,43,967; 1903-4, 725,003 cwt., valued at Rs. 36,27,590; 1904-5, 812,284 cwt., valued at Rs. 40,96,034; 1905-6, 867,229 cwt., valued at Rs. 44,87,709; and in 1906-7, 814,781 cwt., valued at Rs. 48,37,461. The largest quantities come usually from Turkey in Asia, *viz.*, 479,200 cwt. in 1906-7; Arabia, 238,101 cwt.; and Persia, 73,863 cwt., and are received chiefly by Bombay and Sind, which took as their shares 562,335 cwt. and 205,571 cwt. respectively."—(Watt).

I think it is not out of place to say a few words about the so-called "date-marks" or "Baghdad boils," as some wanted to find a connection between these boils and the eating of dates. The boils make their appearance in July or August as a small pimple, which grows very slowly for several months, and then becomes tender and swollen, continues as an open sore for some months more and slowly dries up. Considering the virulence of the sore, it is remarkably little painful, unless it happens to come on a joint or a part much exposed to knocks. Children are the greatest sufferers, and are always attacked on the face. Scarcely any resident of Baghdad, either European or Native, escapes from these boils, which in severe cases may cause the loss of the sight of an eye or carry off a bit of the nose or lip. Why the name "date-marks" should be given to these boils is not easy to understand; many explanations are offered but none seem satisfactory. Some say that they come from eating dates, but this is certainly untrue. Others maintain that they are so called because they afflict people in date-bearing countries; but this explanation does not hold good either, for Basra is far more the region of Date Palms than Bagh-

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dad, and yet is free from the plague of boils. Another theory is that they are called date-marks, because they almost always begin during the season of the ripening of the dates, and yet another that the name comes from the shape of the scar left, which is generally a long oval, not unlike the shape of the fruit. Some people boldly, casting aside any connection between the boils and dates, lay the blame on the unprotesting mosquito (*cf.* Journal, B. N. H. S., XVIII, 700). And they are right in doing so. Dr. Wright discovered in 1903 a small protozoon, called Leishmania tropica Wrightii, which is transferred to man by mosquito bites. This parasite causes first an inflammation, then a swelling and, finally, a boil.

CULTIVATION.—In the "Agricultural Ledger" (1906, No. 1), Mr. Fletcher gives a full account of the conditions under which successful cultivation of this valuable tree is carried out in countries other than India. He ascribes the uniform failure of the many attempts that have been made in this country to improve and extend the very limited cultivation of the Date Palm, to a lack of appreciation of those conditions. We give in the following some extracts from Mr. Fletcher's article :—

"The low relative humidity and rainfall in all typical date-growing regions is very marked, and the lower these factors are the better is the quality of the dates grown. Excessive humidity probably acts indirectly by tempering the heat of the sun, while rain at the time of flowering spoils the pollen and during the ripening season causes fermentation in the fruit. The general time of flowering in almost all regions of the date belt is March to May and that of ripening August to November."

On an average, rainfall during the flowering and fruiting period should not much exceed 5 inches. In addition to this, irrigation is an essential accompaniment to the cultivation of the Date Palm. When the trees are in a dormant condition they can stand a temperature as low as 20° F., but for the formation of flowers and fruits a mean temperature of more than 64° F. is required; early varieties of dates will ripen fruit, if the mean temperature for the fruiting season (May to October) is above 70° F. and for one

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month at least above 80°. For the moderately late varieties these temperatures must be above 75° and 85° respectively, and for the best and latest varieties 84° and 94°. The tree must, moreover, be exposed to the direct rays of the sun; it will not grow under shade even when young.

The physical character of the soil, whether sand, loam or heavy clay, seems to have little influence on the growth and productiveness of the tree, except, perhaps, that on light soils flowers and fruits develop earlier than on heavy ones. On the whole sandy loams appear to be best suited for the cultivation of dates.

The Date Palm is equally indifferent to the quantity of alkali in the soil. The United States Department of Agriculture investigating the soils of the Algerian palm-bearing tracts came to the conclusion that this plant, although it can grow in soils containing 3 to 4 per cent. of their weight of alkali, does "not produce fruit, unless its roots reach a stratum of soil where the alkali content is below 1 per cent. and does not yield regular and abundant crops unless there are layers in the soil with less than 0·6 per cent. of alkali."

Propagation may take place in two ways by seeds and offshoots. Mr. Fletcher describes the method of rearing seedlings as follows:—"The seeds should be sown in a seed-bed that has been specially prepared on sweet soil by ploughing in a mixture of ordinary farmyard manure and on oil-cake at the rate of about 10 tons of the former and 400 lbs. of the latter per acre. Suitable oil-cakes for India are those obtained from the castor-oil plant (*Ricinus communis*), *Eruca sativa* or any of the mustard family; these cakes have the property of more or less preventing the attacks of white ants. Emphasis is laid on the fact that the soil of the seed-bed should be sweet and not impregnated with alkali soils (reh or usar lands), since, though offshoots and adult plants will tolerate large amounts of such salts, a very small percentage of these in the soil will suffice to kill the seedlings soon after germination, if not actually to prevent germination.

"After this preparation, the seed-beds should be irrigated in March or April and two or three days later the seeds sown in it at a depth of 1 or 2 inches in rows, 3 feet apart with intervals of 3 feet

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between seeds in the rows. The bed should then be watered every second day or so for the first three or four months and after that every week for a second period of similar duration; thenceforward the palms should be irrigated every month in the hot weather and every two months in the cold weather.

"The seedlings may be transplanted from April to September after reaching the age of three years. Preferably they should be left in the seed-bed until they flower. This in good soil may occur six to ten years after sowing—the shorter period being sufficient in a locality where the average temperature is high. When the flowers appear and then only the sex can be determined with certainty; the superfluous males may, therefore, now be weeded out and abandoned. During the process of transplantation the largest leaves of the seedlings should be cut off at a distance of about 2 feet from their bases. Special attention is called to the fact that though the adult palm requires water of irrigation only at long intervals or not at all if the subsoil is kept constantly moist by natural sub-irrigation, the seed will not germinate or the seedling survive unless water is present in abundance."

As one male tree will, under cultivation, suffice for the fertilization of about 100 females, it is evident that propagation by seeds is not to be recommended. The only rational method is by means of offshoots.

These are suckers arising from the base of the stem when the tree is between about 6 and 16 years old. Offshoots borne on male trees will give rise to male trees, and on female trees, females. The fruit will be of the same quality as that of the parent palm.

When the offshoots are from 3 to 6 years old they are separated from their parent with an ordinary hatchet by means of a cut parallel to the stem. The large leaves are removed and only the bud and young leaves are left on the rootless stump. April to September is probably the best time for the removal of the suckers in India. "The offshoots should be planted in rows 25 feet apart with similar intervals between plants in the row. For this purpose holes 3 feet deep and the same distance in diameter are made in the soil; half of the excavated earth is mixed with its own volume of farmyard manure with 4 or 5 lbs. of oil-cake and

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filled in, the offshoot being set in the centre of this hole. In doing this it is most important that the bud in the centre of the leafstalks and young leaves should not be choked by being covered with soil. For this reason the offshoot should be planted with the bud two or three inches above the general level of the ground and a circular trench a foot in width be dug round it for the purpose of irrigation. The offshoots should be watered every day for the first month, twice a week for the second month, and thenceforward every month for at least a year." No general rule can be given with regard to the amount of water required. This depends on local conditions; further, the palm needs more water during certain seasons of the year than others. Generally, at the time of flowering (February to March) little or no water should be given; from May till the fruit ripens water should be given liberally.

The time of flowering is determined by climate and soil, and the amount of water applied to the trees. Generally speaking, eight years in the case of propagation by seed, and four or five years after being detached from the parent stem in the case of propagation by offshoots, may be considered to be the age at which appreciable quantities of fruit are produced. The male inflorescence with its enclosing spathe is cut from the tree usually immediately before, but sometimes immediately after the splitting of the spathe. One inflorescence consists of over 100 slender branches, of which one or two bear sufficient pollen to fertilize a whole female inflorescence. When the female inflorescence becomes visible between the separating parts of its spathe, one or two branches of the male inflorescence are inserted among its branches. The enclosing branches of the female inflorescence are then loosely bound together with a thin strip of a palm leaf or string. This is regularly done in Arabia, but not in Sind.

About the beginning of June it is advisable to remove some clusters of fruit from the tree in order to increase the supply of good material to the remainder. One inflorescence will develop from 10 to 40 lbs. of ripe dates; a whole tree yields from 50 to 500 lbs., on the average 120 lbs.

The dates of one bunch do not ripen at the same time. In spite of this the bunch is usually cut off bodily when about half of the

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dates are ripe and is hung in a dry shady place until the rest ripen; but if the variety is a valuable one, the dates are picked singly as they ripen.

The varieties of dates number some thousands in all. According to Mr. Fletcher they may be classed as belonging to three types:—

Class I.—"Soft Dates."—These are the kind sold in the European and American markets. The percentage of sugar they contain is so high (60 per cent.) as to preserve or candy them naturally. In some cases it is necessary to allow some of the syrup to drain off before packing.

Class II.—"Medium Dates."—These, too, are soft, but do not contain enough sugar to preserve them naturally. They do not dry readily and are, therefore, generally eaten fresh from the tree.

Class III.—"Dry Dates."—These are hard and not sticky even when ripe and may be allowed to dry on the tree. They can be stored without special preparation. They are esteemed in date-growing tracts for local consumption though not so sweet as the preceding classes.

Mr. Fletcher gives an instructive table of some well-known varieties of dates, which might be of interest to many who have no access to the publications of the Agricultural Department:

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SOME WELL-KNOWN VARIETIES OF DATES.

Type.	Country.	Centre.	Name of Variety.	Date of ripening.	Soil required.	Market.	Remarks on character of fruit.
Class I.	Morocco ...	Tafilet Oases	Tafilet ..	October ..	Sandy ...	England	Darker than the Deglet Noor.
	Algeria ...	Tougourt	Deglet Noor...	" ...	" ...	America and England	Medium size and dark brown.
		M'zab	Teddala ...	September ...	" ...	Local	Long and yellow.
		Biskra	Ghars ...	" ...	Clay ...	"	
	Tunis ...	.....	Monakhir ..	October (end)...	Sandy ...	"	Said to be superior even to Deglet Noor.
	Egypt ...	Seewah Oases	Wahi or Sewi .	August ...	" ...	Fayum (Egypt) ...	Plump and yellow.
		Lower... Sharkiah ...	Amri ..	September .	Clay ...	Europe	Large and black.
		Lower... Gizeh	Ambat ...	" ...	Sandy ...	Local	" " "
	Arabia ...	El. Hassa	Khalasi ...	August ...	" ...	"	Medium size and golden brown.
		Muscat (Semail Valley) ...	Fard ...	" ...	" ...	America	" " " dark brown.
	Mesopotamia.	Bussorah	Berhi ...	September ...	Heavy clay ...	Local	" " " golden brown.
			Hevesi ...	" ...	" ...	"	" " " " "
			Helwi ..	" ..	" ..	America and Europe..	" " " dark brown. Superior quality.
			Khdravi ...	" ...	" ...	" " " ..	Like Helvi, but darker and not so good.
			Sayer ...	" ...	Sandy ...	America	Medium size, dark brown, not very good.
		Bagdad	Maktum ...	August ...	Heavy clay ...	Local	Medium size and golden brown
			Kustawi ..	" ..	" ..	"	Like Maktum, but not so good..
			Taberzal ...	Sept. (end) ...	" ...	"	Small, dark brown, very good.
	Persia ...	Minab	Murdasing ..	.....	.....	.....	.....
	Baluchistan ...	Pangh Gurh	Mozati ..	.....	Sandy ...	Local	Medium size, dark brown, excellent.
Class II.	Egypt ...	Upper Bedrashen... ...	Ambat ...	August ...	" ...	"	Medium size, yellowish brown
		Lower. Rosettu ...	Rachidi, Samani	September ...	" ...	South Europe ...	Large and yellow.
		Lower. Marg ..	Hayani ..	July ...	Clay ...	Local	Red and coarse.
		Lower. Alexandria	Ramli ...	September ...	Sandy ...	"	Long and black.
	Arabia ...	Muscat	Nagal ...	June ...	" ...	"	Small and light coloured
			Mubsali ...	August ...	" ...	India	Large " " "
			Khassab ...	" ...	" ...	Local	Medium size and red.
	Mesopotamia ...	Bagdad	Burni ...	" ...	Heavy clay ...	India and Local ...	Small and light coloured.
Class III.	Egypt ...	Upper ... Oases ...	Sultani ...	September ..	Sandy ...	Egypt	Short and brown.
		Upper ... Berber ...	Ibrimi ..	" ...	" ...	"	Long " "
			Gondaila ...	" ...	" ...	"	Large and yellowish brown.
	Mesopotamia ...	Bagdad	Bedraihe ...	" ...	Heavy clay ...	Local	Small and yellowish.
			Zehedi ...	Sept. (end) ...	" ...	.....	" " "

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ILLUSTRATION.—Plate VIII. The photograph, supplied by Mr. Phipson, shows a well developed specimen of *Phœnix dactylifera*, and at the foot of the stem two young specimens which took their origin from the present plant. The habit of the whole tree differs considerably from that of the Wild Date Palm; the crown is less dense, the leaves are spreading and form an acute angle with the stem. The lower part of the stem is not covered with the bases of the petioles.

PHŒNIX RECLINATA, Jacq. Fragm. Bot. (1809) 27, t. 24; Willd. Sp. Pl. IV. 731; Spreng. Syst. Veg. II. 138; Klotzsch in Kunth, Enum. Pl. III. 256. Mart. Hist. Nat. Palm. III. 272, 321, t. 164, 124, f. 1. Becc. Males. III. 349.—*P. spinosa*, Thonning in Videnskabernes Selskabs Afhandl, IV. (1829), p. 211; Hornemann, De ind. plant. Guineens. 11; Klotzsch in Kunth Enum. Pl. III. 257; Mart. in Gel. Anzeig. der Bayr. Akad. der Wiss. 1839 VIII. 892, IX. 988; Hist. Nat. Palm. III. 275, 320; Kirk in Journ. Linn. Soc. IX. 234; Tchihatchef in Griseb.: La Végét. du Globe II. 193; Drude in Engl. und. Pr.: Die Nat. Pflanz. I. 29, fig. 23; F. v. Mueller, Select Extra-trop. Pl. 263.—*P. leonensis*, Loddiges in Cat. Horti.—*P. farinifera* (non Roxb.) Zolling Pl. Jav. exsicc. No. 3098; Cat. Pl. quæ in hort. Bot. Bogor. col. (1866) p. 72.—*Fulchironia senegalensis*, Leseb. in Desf. Cat. Hort. Paris., ed. III. p. 29.

DESCRIPTION.—Stem soboliferous, 25 feet high, sometimes even 30-40 feet. Leaves long, armed with solitary or paired spines on the sides and lower surface. Segments narrow ensiform, very numerous, in fascicles of two or three. In young leaves the segments are covered with a white tomentum on the under surface of the midrib. A similar tomentum covers the whole central bud. Spathes of spadices fusiform, furfuraceous or glabrous, compressed, thinly coriaceous, with two sharp keels. Male spadix ovate in outline, consisting of a great number of thin, flexible branches. Male flowers trigonous, lanceolate, distinctly acuminate, about 4 lines long; calyx 3-dentate; petals lanceolate, acuminate or acute and often ciliate at the apex, but never cucullate. Stamens shorter than the corolla. Female spadix composed of 25-35 rigid

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branches ; fruiting branches patent or horizontal, or also reflexed. Fruit small, ovate-elliptic, mucronate. Perianth (in fruit) cupular, a little more than 2 lines long and 4 lines broad ; calyx 3-dentate, a little less than half the length of the corolla. Petals not striate externally. Staminodes 6, dentiform, narrow, not united at the base. Seed oblong or subterete-cylindric, equally rounded at the two extremities ; in a median transverse section the process of the raphe is not seen, or is scarcely dilate, obtuse or superficially lobulate ; longitudinal groove of seed pretty long.

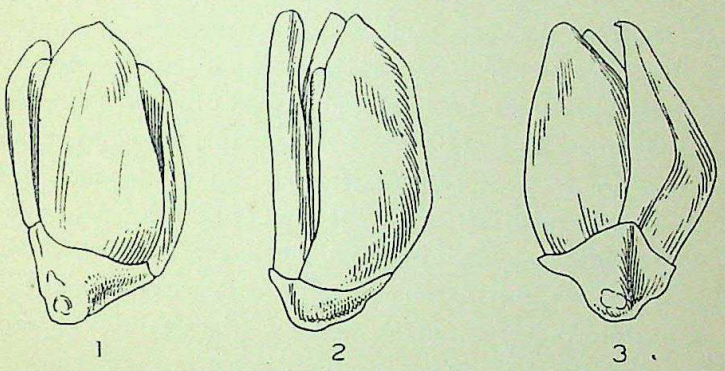

FIG. 4.

Male flowers of *Phœnix reclinata* (5×). (After Beccari).

HABITAT.—Throughout Tropical Africa from Senegal to Kaffirland : Sansibar (rare), Pemba, Usambara (on the coast), Uganda.

USES.—The split leaf is made into fine mats and caps which take colour easily, and are worked of many patterns. The green bunches of fruit, if immersed for 12 hours in water, suddenly assume a rich scarlet hue, and the astringent pulp becomes sweet. Wine is also obtained from this palm.

ILLUSTRATION.—Plate IX. The photograph, supplied by Major Gage, shows a characteristic tuft of specimens of *Phœnix reclinata*. The leaves which touch the ground belong to younger plants that have been produced by the parent stems.

PHŒNIX CANARIENSIS, Hort. Chabaud, La Provence agricole, No. 19 (Oct. 1882) p. 293, fig. 66-68. Naudin in Revue Horticole 1885, p. 541, et 1888, p. 180 ; Illustr. Hort. XXXIII, 8 ; Becc. Males. III. 371.—*P. dactylifera* β. *jubæ*, Webb. et Berth. Hist. Nat. des Canaries, III. 289 ; Christ

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in Engler's Bot. Jahrb. VI. 469.—*P. judae,* Christ in Engl. Bot. Jahrb. IX. 170.—*P. tenuis,* Hort.—*P. vigieri,* Hort, Revenue Hort. 1888, p. 180.

DESCRIPTION.—Stem solitary, when young covered with the petioles of fallen leaves and then very often forming a bulbiform mass, in old plants cylindric, columnar and stout, reaching a height of 40-50 feet. The crown exceedingly large, hemispheric, dense, consisting of about 200 leaves. Leaves 17-20 feet long, the base of the stalk thick and turgid, more so than in *Phœnix dactylifera* ; the stalk is very short, armed with strong, long spines. On each side of the rhachis there are 150-200 segments, of the same green colour on the upper and lower surface, straight but not rigid, those lowest and next to the spines in fascicles of 2 or 3, above these they are less fascicled, but turned in various directions, those of the upper half of the leaf equidistant, not aggregate and almost opposite to each other. Male panicle on the whole ovate, with strongly angular branches ; the longer branches 1 foot long. Male flowers alternate, often in pairs, ovate-asymmetrical, angular by mutual pressure, 6 lines long ; calyx cup-shaped-obconic, trigonous, sharply 3-dentate ; petals densely striate, thinly coriaceous, obtuse or slightly acute. Stamens slightly shorter than the petals ; pistillode very small, papilliform, acute. Female flowers globose-depressed, 2-3 lines in diameter; calyx cupular, 3-ribbed, very acutely 3-dentate. Corolla by $\frac{1}{4}$ longer than the calyx ; staminodes tooth-shaped, very small, perfectly free ; petals twice as broad as long, subreniform, obtusely apiculate in the centre, sometimes the petals are shorter than the sepals. Branches of fruiting spadix 1-2 feet long, semiverticillate or spreading, erect patent, stout and rigid. Fruit ovate-elliptic or subglobose-ovate, equally rounded at both extremities, slightly apiculate at the apex, yellow when ripe, smooth, $\frac{3}{4}$ inch long, 9 lines broad, pericarp thin, crustaceous, fragile. Seed ovate-elliptic or ovate-oblong, rounded at the two extremities, terete, or in a transverse section perfectly round, convex on the ventral side. Dorsal groove quite straight and deep ; process of the raphe, as seen in a median transverse section, very narrow in the beginning, getting broader and deeply lobed at the base ; albumen horny, fragile, very hard ; embryo almost in the middle of the ventral side.

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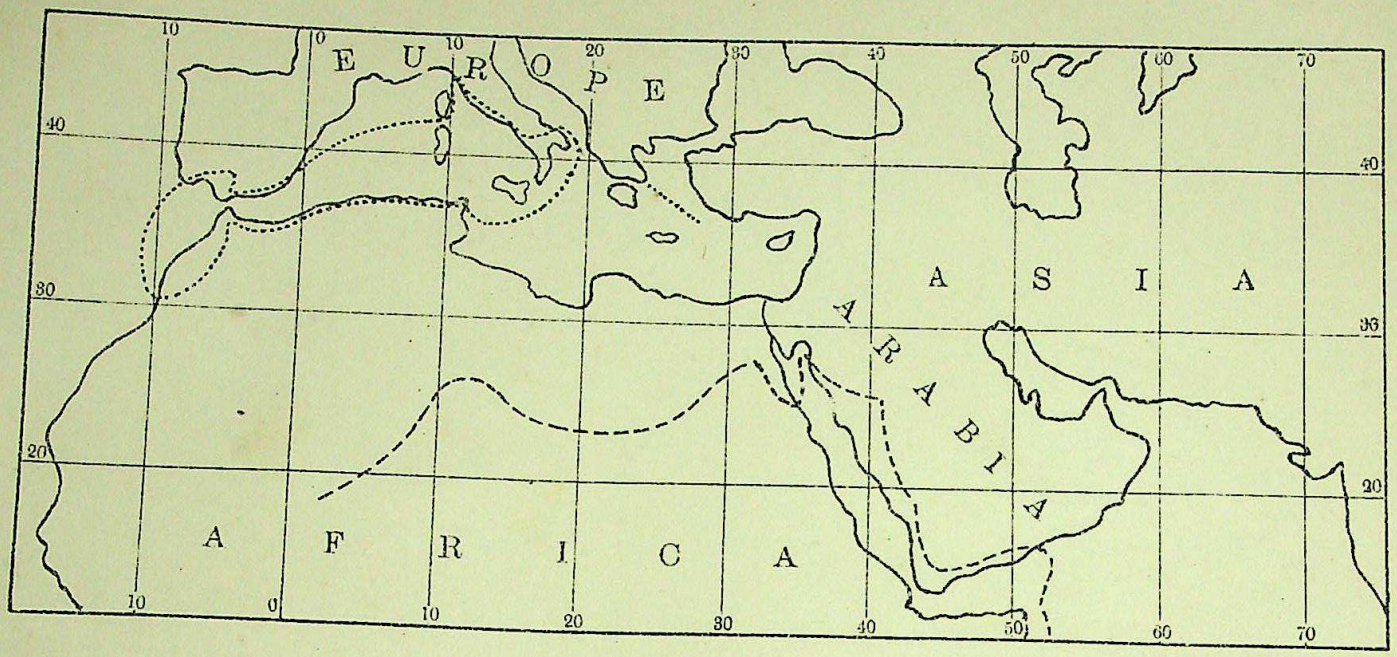

Distribution of *Chamaerops humilis* shown thus .....

Northern limit of *Hyphaene thebaica* shown thus _ _ _ _ _ _ _ _

[AFTER FISCHER]

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HABITAT.—Canary Islands.

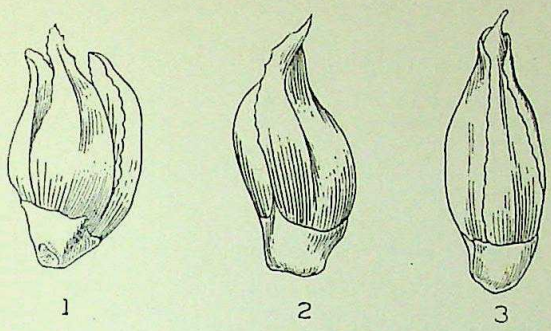

FIG. 5.

Male flowers of *Phœnix canariensis* (4×). (After Beccari.)

2. SABALEÆ.

Polygamous. Several or numerous half-complete spathes or such as cover only the peduncle of the spadix, often also on the branches of the panicle. Leaves fan-shaped, induplicate.

DISTRIBUTION.—The *Sabaleæ* have, after the *Arecineæ*, the greatest geographical distribution:

On the eastern hemisphere: *Chamærops* L., *Trachycarpus* Wendl., *Rhapis*, L., *Corypha*, L., *Nannorhops* Wendl., *Licuala* Thunb., *Livistona*, R. Br., *Pritchardia*, Wendl. Seem, *Theysmania*, R. f. Zoll.

Southern Europe, Northern Africa, Asia, south of the northern limit of the region of palms including all the islands from Ceylon to the Sandwich Islands, north and east coast of Australia to the south coast (37½° S. Lat.).

On the western hemisphere: *Sabal*, Adans., *Rhapidopyllum*, Wendl., *Acanthorrhiza*, Wendl., *Trithrinax*, Mart., *Brahea*, Mart., *Serenœa*, Hook, f., *Colpothrinax*, Wendl. Griseb, *Erythea*, S. Wats., *Copernicia*, Mart., *Thrinax* L., *Crysophila*, Bl..

America, from the northern limit of the palms to almost the southern limit (36° N. Lat.—32° S. Lat.), but are not found in the tropical region of the Amazonas.

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Key to the genera described below :—

A.—Fruit with a smooth pericarp. *Gynœcium* of 3 free carpels; each carpel with its own style or stigma.

a. Perianth of 3 sepals and 3 petals alternating with the sepals.

[1] Seed erect elliptic; albumen ruminate ... *Chamærops.*

[2] Seed curved-reniform; albumen with a single excavation near the raphe ... *Trachycarpus.*

[3] Seed flat-globular; albumen with a deep excavation filled with a corky substance, otherwise uniform ... ... *Rhapis.*

b. Perianth of 6 bristles, or of 6 leaves grown together ... ... *Thrinax.*

B.—Fruit with a smooth pericarp. *Gynœcium* of 3 appressed carpels, or carpels united where they meet; stigma one.

a. Spadix terminal; remains of stigma at the base of the fruit.

[1] Embryo apical, spiral ... ... *Corypha.*

[2] Embryo dorsal or subbasilar ... ... *Nannorhops.*

b. Spadix axillary, lateral; remains of the stigma apical (except in Sabal).

α Berry drupaceous; endocarp hard, brittle.

[1] Filaments on a fleshy urceolus which is united with the corolla ... ... *Licuala.*

[2] Filaments free, slightly coherent at the base ... ... *Livistona.*

β Berry drupaceous on a cylindrical stalk. *Pritchardia.*

γ Berry with a soft membranous endocarp.

[1] Albumen uniform, except for an excavation near the umbilicus or raphe ... *Sabal.*

[2] Albumen deeply ruminate ... ... *Copernicia.*

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CHAMŒROPS, L. GEN. NOT. 1219.

(From the Greek "Chamœrops": "chamai" = on the ground, and "rops" = bush. Plinius called it Chamœrepes, which means "creeping on the ground.")

Mart. Hist. Nat. Palm. III. 248, t. 120, 124 (sp. 1).—Kunth Enum. Pl. III. 248.—Drude Bot. Zeitg. 1877, 638.—Benth and Hook. Gen. Pl. 924, 86.

Stem mostly low, bushy-cæspitose, covered with the remains of the petioles, leaves terminal, stiff, fan-shaped, regularly divided; petioles slender, spinous. Spadix short, erect, with mostly 2 leathery spathes, flowers diæcious or polygamous on the short branches of the simply-branched spadix, small, yellow. Petals broadly ovate-acute. Stamens 6 (—9); filaments short, situated on a fleshy cup. Carpels thick-fleshy with sessile stigmas, each flower developing 3 berries, rarely more, sometimes less. Berry elongateerect, with the remains of the stigma slightly lateral, reddish-brown or yellowish. Seed elliptic or ovate. Albumen ruminate.

Species 2.—In the western part of the Mediterranean region.

CHAMAEROPS HUMILIS, L. Hort. Cliff. 482; Willd. Spec. Pl. IV. 1154, n. 1; Houttuyn Pflanzensyst I. 55; Giseke Prael. Ord. nat. 27; Savigny in Lam. Encycl. IV, 714, et. Illustr. gen. t. 900; Spreng. Syst. Veg. II. 137, n. 1; Roem. Schult. Syst. Veg. VII. 2. 1488, n. 1; Mill. Diction. I. 669; Brotero Fl. Lusit. I. 605; Cambess. Plant. Balear. in Mèm. du Mus. XIV. 321; Herrera Agricultura general (1818) II. 389; Allion. Fl. edemont. II. 363, n. 866; P De Cand, Fl. Franc, III. 723; Moris Elench. Stirp. sard. I. 47; Sebast. et Mauri Prodr. Fl. Roman. 135; Tenore Sylloge Fl. Neapol. 535; Philippi in Linnæa VII. 759, 760; Poiret Voy. en Barbar. II. 273; Desfont. Fl. Atlant. II. 436; Viviani Fl. Lib. specim. 62; Fraas Synops. plant. flor. class. 278.

NAMES:—Dwarf Fan Palm, European Palm; Palmeira, Palma das Vassouras (*Portug.*); Palmito, Margallonera (*Span.*); Palma (*Andal.*); Palmiste (*French*); Palmito (*Ital.*); Palmetta, Piumara, Giummara, Curina (*Sicily*).

DESCRIPTION.—Grows in hot-houses to the height of 15 feet and more; but in Spain and Barbary it is not more than 4 or 5 feet

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high, and in Italy it is much dwarfer, stem 5-6 inches in diameter closely covered with triangular hard scales, the bases of the old leaves. The new leaves grow in a tuft at the top of the stem, and have smooth flat stalks, with rigid spines proceeding from the edge; blade deeply palmate, with from 12-15 narrow sword-shaped divisions, which are slightly glaucous and downy. Spadix short compresed; spathes 6-8 inches long, compressed, downy at the edge.

This palm is too well-known as to need a detailed description.

C. humilis is a very variable palm. We mention only the following varieties: *C. humilis var. arborescens*, Mart (=*C. arborescens* Pers., *C. elata* and *tomentosa*, Hort.) of N. Africa; var. *bilaminata*, Wendl.,—*conduplicata*, Kickx.; *glaucescens*, Rgl.; *gracilis*, Lodd.; *inermis*, Rgl.; *melanacantha*, Rollis; *robusta*, Van Houtte, etc.

HABITAT.—This is the only palm indigenous to Europe. It is found as far up as Nice in Italy, but thence southward it has a great range, being met with in all the countries bordering the Mediterranean Sea.

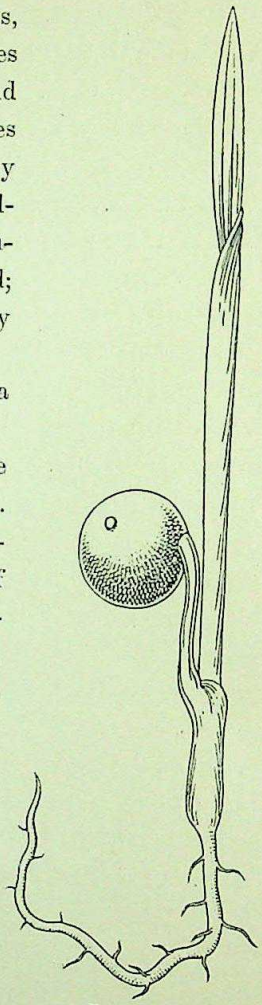

FIG. 6.
Germination of seed of *Chamaerops humilis*.
(After Martins.)

USES.—The fibres furnished by the stem mixed with camel's hair are used for making tent covers. Of the leaves they make baskets, and cordage from all parts of the plant. The palm also affords materials for paper-manufacture. The tree furnishes a fibre resembling horse-hair, which is firm and elastic, and is used in great quantities in the manufacture of carpets, under the name of vegetable or African hair. The sails made from it are better than those prepared from the Spanish broom (*Genista*

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scoparia, Lam.). The fibres, divested of the glutinous matter which binds them together, are extremely divisible, as fine as flax, and can be used, in spite of their inferior length (10-16 inches), in the preparation of flax cotton.

CULTIVATION IN EUROPE.—The Dwarf Fan-Palm is a greenhouse tree of very easy culture in a compost of rich strong loam, to which is added a small portion of vegetable mould and sand. Perfect drainage and copious supplies of water throughout the summer, are most essential to success. Propagation may be effected by suckers or by seeds.

If the palm is employed in sub-tropical gardening, it should have a situation sheltered from strong winds.

ILLUSTRATION.—Plate X shows a clump of Dwarf Fan Palms which are growing in the Government Horticultural Gardens of Lucknow. The leaves of two specimens have been badly attacked by insects.—We have to thank Mr. H. J. Davies who kindly supplied us with the photograph.

TRACHYCARPUS, H. Wendl. Bull, Soc. Bot. Franc. VIII. 429. From the Greek "Trachys"=hard, rough, and "carpos" fruit, probably in allusion to the rough, hairy fruit.

Mart. Hist. Nat. Palm. III. 251 (spec. 3, 4, 7), t. 125.—Wall. Pl. Asiat. Rar. III, t. 211.—Bot. Mag., t. 5221 (excl. fig. 6, 7.)—Griff. Palms Brit. Ind., 133, t. 227 A, B.—Kurz For. Fl. II. 526.—Benth. & Hook. Gen. Pl. III. II. 928, 98.

Tall, unarmed palms. Leaves suborbicular or reniform, plicately multifid; segments narrow, rhachis O. Spadices many, interfoliar, stout, branched; spathes many, sheathing, embracing the peduncle and branches of the spadix, coriaceous, compressed, tomentose; bracts and bracteoles minute. Flowers small, polygamo-monoecious. Sepals 3, ovate; petals 3, broadly ovate, valvate. Stamens 6, filaments free; anthers short, dorsifixed. Carpels 3; stigmas 3, recurved; ovules basilar. Drupes 1-3, globose or oblong; style subterminal. Seed erect, ventrally grooved; hilum basilar; albumen equable; embryo dorsal.

Species 3.—Himalaya, China, Japan.

CULTIVATION IN EUROPE.—All the species of this genus are easily cultivated; they are greenhouse or half-hardy palms. They

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grow well in a compost of rich, strong loam with a small portion of vegetable mould and sand. Perfect drainage, and copious supplies of water throughout the summer are essential. They may be propagated by suckers or by seeds.

TRACHYCARPUS MARTIANA. H. Wendl. in Bull. Soc. Bot. Fr. VIII. (1861) 429; Hook. Fl. Brit. Ind., VI. 436.—*T. khasiana,* H. Wendl. l. c; Hook. f. Bot. Mag. t. 7128.—*Chamaerops martiana,* Wall. Cat. n. 8621; Mart. in Wall. Pl. Asiat. Rar. III. 5, t. 211; Hist. Nat. Palm. III. 251, 320; Royle Ill., 394, (-73-9); Griff. in Calc. Journ. Nat. Hist. V. 339; Palms Brit. Ind. 133.—*Chamaerops griffithii,* Lodd. Cat. Palm. 1841; Hort. Par. ex Rev. Hortic. 1879, 212, f. 43, ed. 1881, 143.—*Ch. khasyana,* Griff. in Calc. Journ. Nat. Hist. V. 341; Palms Brit. Ind., 134; t. 227 A, B, C; Brand. For. Fl. 546; Kurz in Journ. Asiat. Soc. Beng. XLIII. 204; For. Fl. II. 526; Gamble Man. Ind. Timb. 418; Houllet in Rev. Hortic. 1879, 272.

NAMES.—Jhangra, Jhaggar, Tal, Takil (Kumaon); Pakha (Ass.); Taggu (Newar name in Nepal).

DESCRIPTION.—A tall, slender tree, 20-50 feet high, often stunted on dry ground or in otherwise unfavourable localities, with a globose crown of dark shining leaves, clothed beneath the crown with persistent leaf-sheaths; young parts furfuraceously hairy. Petioles 3 feet long, the sheathing base consisting of two layers, the inner layer, which separates from the outer, being composed of a net-work of brown tough fibres, crossing each other at oblique angles, forming a close network of rhomboid meshes; upper part of petiole half-round, woolly, edges slightly denticulate. Blade orbicular, consisting of 30-40 linear segments, 15-20 inches long, connate to one-third or one-half their length, emarginate or shortly bifid at the top, rigidly coriaceous. Spadix a drooping compound panicle, 1-1½ foot long, covered with dark rust-coloured down, with several stout main branches, each in the axil of a large coriaceous sheathing bract; basal spathes 1 foot long. Petals ovate, concave whitish; stamens 6; filaments subulate, nearly free, longer than the anthers. Ovary and the rudiments of ovary in male flowers, hairy. Drupe 1. oblong, at first yellow, dark glossy blue when ripe.

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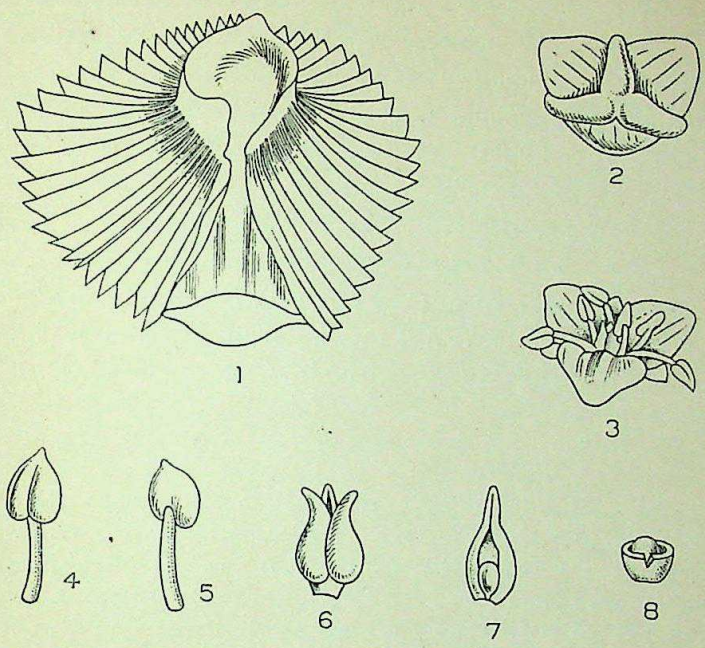

FIG. 7.

Trachycarpus martiana

1. Base of lamina of leaf and ligule.
2. Back view of flower.
3. Flower.
4 and 5. Stamens.
6. Carpels.
7. The same dehising when still young
8. Transverse Section of the same showing the ovule. (2—8 magnified)

(After Hooker).

HABITAT.—Central Himalaya, Kumaon and Nepal, 5-8,000 feet; Khasia Hills, 4-5,000 feet; Manipur 6,000 feet; Upper Burma, Kachin Hills, 4-6,500 feet. (Grows in great numbers, forming clumps and rows, on the Thakil Mountain in Eastern Kumaon, in the Fork between the Sarju and Kali rivers, between 6,500 and 7,800 feet, where snow generally covers the ground from November till March above the zone of *Pinus longifolia* in the region of Quercus, Rhododendron, Andromeda, and Taxus, in damp shady glens on the north and south-east, but chiefly on the north-west side. Also on Dhuj Mountain, north-east of the Thakil, on the Kalimoandi range between the Ramgunga and Gori rivers, and in the

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Sarju valley near Bagesar. Dwarf specimens were found at the base of the Satbunga Mountain, south-east of the Gagar Pass, in very dense forest at 6,500 feet elevation, and on the Berchula, a spur of the Bhatkot Mountain, considerably farther in the interior, and at about 8,000 feet elevation, which probably is its western limit).

ILLUSTRATION.—Martiu's Chusan Palm which is figured on Plate XI A, is kept in a hot house of the Kew Gardens, whilst Fortune's Chusan Palm (Plate XI B) is growing in the same garden in the open. We owe the two photographs to the kindness of Mr. A. W. Hill, the Assistant Director of the Royal Botanic Gardens in Kew.

TRACHYCARPUS EXCELSA, H. Wendl. in Bull. Soc. Fr. VIII, 429; Hook. f. Fl. Brit. Ind. VI, 436.—*Trachycarpus fortunei*, Wendl. l.c.—*Chamaerops excelsa*, Thunb. Fl. Jap. 130 (not var. β); Mart, Hist. Nat. Palm. III. 251; Miquel Fl. Jap. 329; J. Gay in Bull. Soc. Bot. Fr. VIII. 410; Franch. et Sav. Enum. Pl. Jap. II. 1; Carrière in Rev. Hortic. 1877, 223.—*C. fortunei*, Hook. Bot. Mag., t. 5221.

NAME.—Fortune's Chusan Palm.

DESCRIPTION.—Stem of considerable height, clothed throughout with old leaf sheaths and a good deal of course transverse fibre, which also abounds among the perfect foliage. Leaves forming a handsome, more or less spreading crown. Petioles $1\frac{1}{2}$ foot or more long, convex below, nearly plain above, the margin quite unarmed or very obscurely toothed. Lamina semiorbicular, flabellate, $1\frac{1}{2}$ foot long and broad, deeply plaited, cut for about a half or more of the way down into numerous linear segments, which are $\frac{3}{4}$-1 inch broad, pendulous towards their apices. Spadix small in proportion to the plant, and consequently not very conspicuous, emerging from several imbricating leafy bracts, and constituting a dense thyrsoid panicle, more than a span long and clothed with yellow flowers. Flowers clustered, 2-4 on a tubercle, sessile. Calyx small, of 3 sepals. Corolla of 3 orbicular petals. Stamens inserted on the base of the petals. Ovaries 3, ovate, hairy, tapering upwards into a thick subsulate style. Drupe reniform, deeply hollowed on one side; embryo opposite the umbilicus.

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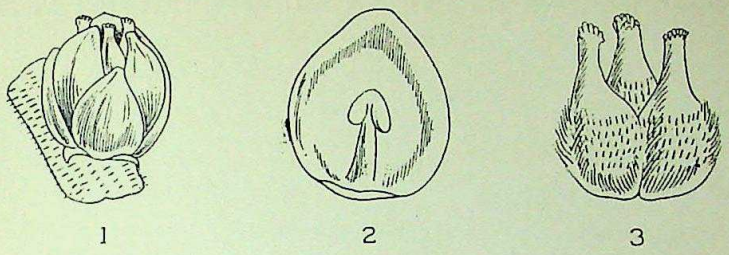

FIG. 8.

1. Female flower of *Trachycarpus excelsa*
2. Petal and stamen of the same.
3. Ovaries of the same.

All magnified.
(After Hooker.)

HABITAT.—Upper Burma, Yunan; China, Japan.

USES.—The brown fibre surrounding the trunk is very strong; the Chinese employ it for many domestic purposes. It is made into ropes and cables for the junks and wrought into bed bottoms, used by all classes of the population. Labourers and coolies in Northern China make hats from the leaves. Also their "so-e," or garment of leaves, which they wear in wet weather, is manufactured from the leaves of this palm.

CULTIVATION IN INDIA:—It needs protection from strong sunshine when grown in the plains.

(To be continued.)

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DESCRIPTIONS OF INDIAN MICRO-LEPIDOPTERA.

BY

E. MEYRICK, B.A., F.R.S., F.Z.S.

XIII.

(*Continued from page* 462 *of this Volume.*)

GELECHIADÆ.

Lecithocera, Hs.

To this genus I would now also refer *signifera*, Feld.

Lecithocera deltospila, n. sp.

♂. 21 mm. Head whitish-ochreous, tinged centrally with purplish. Palpi ochreous-whitish, second joint dark fuscous except apex. Antennæ 1, rather stout, whitish-ochreous, ciliations $1\frac{1}{2}$. Thorax whitish-ochreous, shoulders narrowly dark fuscous. Abdomen pale ochreous. Posterior tibiæ fuscous, apex ochreous-whitish, tarsi whitish-ochreous. Forewings elongate, rather narrow, costa gently arched, apex round-pointed, termen sinuate, oblique; 2 and 3 stalked, 7 to termen, 8 and 9 out of 7; whitish-ochreous; a blackish-fuscous streak along basal sixth of costa; a flattened-triangular blackish-fuscous blotch representing plical and first discal stigmata, extending from near base to middle; an inverted-triangular blackish-fuscous blotch representing second discal stigma; between these blotches are two fuscous spots; dorsum suffused with fuscous from near base to tornus; posterior $\frac{2}{3}$ of wing dark fuscous suffusedly irrorated with ochreous-whitish, tending to form streaks on veins, and cut by a nearly straight whitish-ochreous subterminal line parallel to termen, slightly indented above middle: cilia whitish-ochreous with two fuscous shades. Hindwings light grey; cilia whitish-ochreous, with two faint fuscous shades.

Khasis; one specimen. Allied to *trigonopis*, but antennal ciliations longer, termen of forewings more sinuate, more oblique.

Onebala eremota, n. sp.

♂ ♀. 15-17 mm. Head pale ochreous or brownish-ochreous. Palpi whitish-ochreous, second joint greyish-ochreous except apex. Antennæ whitish-ochreous, ciliations in ♂ 1, fasciculated. Thorax greyish-ochreous. Abdomen pale grey, anal tuft pale greyish-ochreous. Forewings elongate, costa moderately arched, apex rounded-obtuse, termen rounded, somewhat oblique; 2 and 4 stalked, 3 absent, 7 absent, 8 and 9 stalked; light glossy bronzy-fuscous, veins slightly darker: cilia pale ochreous tinged with fuscous. Hindwings pale grey; cilia pale greyish-ochreous.

Matale, Ceylon (Pole); in April and August, two specimens. Closely allied to *myadelpha*, but lighter-coloured, forewings less dilated posteriorly, termen more rounded, stigmata wholly absent, in ♂ without hair-pencil.

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Pachnistis, Meyr.

Allied to *Brachmia*, from which it differs in having vein 7 of forewings absent, 8 and 9 stalked. Besides *cephalochra*, Meyr., which is the type of the genus, I refer here *diluticornis*, Wals., *cherandra*, Meyr., *continctella*, Walk., and the two following species.

Pachnistis exœma, n. sp.

♂ ♀. 13-17 mm. Head and thorax dark purplish-fuscous, sides of head pale ochreous or whitish-ochreous. Palpi pale whitish-ochreous, second joint suffused with dark fuscous except towards apex, terminal joint variably suffused on anterior edge and towards apex. Antennæ pale whitish-ochreous, in ♂ simple. Abdomen light grey, anal tuft whitish-ochreous. Posterior tibiæ rather dark purplish-grey, apex ochreous-whitish, tarsi ochreous-whitish more or less banded with dark grey. Forewings elongate, slightly dilated posteriorly, costa gently arched, apex obtuse, termen nearly straight, rather oblique; 2 and 3 stalked, 4 sometimes out of 2; dark purplish-fuscous; a pale whitish-ochreous cloudy rather irregular streak crossing wing before middle; small whitish-ochreous costal and dorsal spots at $\frac{4}{5}$: cilia purplish-grey. Hindwings pale grey, darker posteriorly; cilia pale grey, sometimes darker round upper part of termen, base whitish-ochreous.

Kegalle, Matale, Peradeniya, Maskeliya, Haputale, Ceylon (Green, Pole, Alston): Cuddapah, 4,000 feet (Campbell); in March, April, and from July to September, twelve specimens. Very like *cherandra*, but in that species there is no entire antemedian line, and the antennæ of ♂ are ciliated.

Pachnistis lygaea, n. sp.

♂. 24 mm. Head brownish. Palpi pale ochreous, second joint dark brown, anterior edge of terminal joint dark fuscous. Antennæ pale ochreous, ciliations 2. Thorax and abdomen dark fuscous. Forewings elongate, costa gently arched, apex obtuse, termen slightly rounded, somewhat oblique; 2 and 3 stalked; rather dark purplish-bronzy-fuscous; discal stigmata rather small, cloudy, blackish: cilia bronzy-fuscous. Hindwings dark fuscous; cilia fuscous.

Dalhousie, Kashmir; in July, one specimen.

Brachmia, Hb.

Head with appressed scales, side-tufts loosely raised; ocelli present; tongue developed. Antennæ $\frac{4}{5}$-1, not stout, in ♂ simple or variably ciliated, basal joint moderately elongate, without pecten. Labial palpi very long, recurved, second joint thickened with appressed scales, seldom loosely expanded towards apex above, terminal joint about as long as second or rather longer, slender, acute. Maxillary palpi very short filiform, appressed to tongue. Posterior tibiæ rough-scaled above. Forewings with 2 and 3 stalked or seldom coincident, 4 sometimes out of 2, 7 to

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apex or near below it, 7 and 8 stalked, 9 often out of 7, rarely 10 also out of 7. Hindwings 1 or over 1, trapezoidal, termen more or less sinuate, cilia ⅓-1; 3 and 4 connate or stalked, 5 more or less approximated, 6 and 7 ftalked.

A considerable genus, most numerous in the Indian region, but fairly represented in Europe and Africa. The species are obscure in appearance, and require careful attention. The stalking of vein 9 with 7 in the sorewings is proved to be variable in some species (as *geræa*), but in others it seems to be constant. The colouring of the antennæ and posterior tibiæ sometimes furnishes good characters. *Torodora*, Meyr., and *Apethistis*, Meyr., cannot be maintained as distinct genera in view of the variability of neuration above-mentioned, and are therefore merged. I describe now 39 new species, and include also in their proper position the other species of the Indian fauna already described, which may assist the comprehension of the genus.

It is difficult to draw a clear line between *Brachmia* and *Lecithocera*, but impossible to unite them. I have included in *Lecithocera* those species in which the antennæ are longer than the forewings, and those in which they are only as long as the forewings but distinctly stout or thickened but there appears to be nearly every degree of transition. *Onebala* differs from *Brachmia* essentially in the absence of vein 3 of hindwings; *Autosticha* in having 7 of forewings absent, 9 separate. These four genera are nearly related together, and all extensively developed in the Indian region, of which they are characteristic.

Brachmia philosopha, n. sp.

♂ ♀. 13-15 mm. Head and thorax fuscous, face paler. Palpi white, second joint externally fuscous except apex, anterior and posterior edges of terminal joint black. Antennæ 1, white ringed with dark fuscous, in ♂ simple. Abdomen fuscous, beneath dark fuscous, in ♂ with a whitish anteapical band. Posterior tibiæ grey, extreme apex whitish, tarsi whitish broadly banded with dark fuscous irroration. Forewings elongate, rather narrow, costa slightly arched, apex round-pointed, termen concave, rather oblique; 3 absent, 7 to termen, 8, 9, and 10 out of 7, 11 in ♂ anastomosing with 12; rather dark fuscous; an irregularly triangular blotch of dark fuscous suffusion on dorsum before middle, reaching more than half across wing; costa suffused with dark fuscous from ⅓ to apex; a small whitish spot on middle of costa, beneath which is a patch of whitish irroration; two small blackish spots edged with a few whitish scales placed transversely in disc at ⅔; an indistinct bisinuate whitish line at ⅘, sharply marked towards costa; a black terminal line: cilia fuscous with four ochreous-whitish lines, basal third on termen yellow-ochreous. Hindwings grey; cilia whitish-ochreous with two broad pale fuscous shades.

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Khasis; in March, three specimens. The peculiar neuration marks this as an extreme form, but it does not seem necessary to separate it generically.

Brachmia compsophila, n. sp.

♂ ♀. 13-17 mm. Head and thorax light ochreous-brown or sometimes fuscous, face whitish-tinged. Palpi whitish, second joint externally suffused with fuscous except towards apex, terminal joint with two black lateral lines. Antennæ 1, white, sharply ringed with dark fuscous, ciliations in ♂ 2. Abdomen light ochreous or greyish. Posterior tibiæ dark fuscous, apex white, tarsi white with dark fuscous basal bands on first three joints. Forewings elongate, rather narrow, costa gently arched, apex round-pointed, termen sinuate, oblique; 2 and 3 stalked, 7 to termen, 8 and 9 out of 7; light ochreous-brown or sometimes fuscous, somewhat infuscated or darker-suffused posteriorly; traces of a white oblique strigula from costa before middle, sometimes obsolete; stigmata faintly darker, plical rather obliquely beyond first discal, second discal forming a transverse mark, but all sometimes quite obsolete; a fine oblique white strigula from costa at $\frac{3}{4}$, whence a faint angulated whitish line proceeds to tornus; a black apical dot, more or less edged with white above and beneath; an interrupted blackish terminal line: cilia ochreous-brown or lilac-fuscous, apical third on termen white preceded by a darker line. Hindwings fuscous, sometimes paler towards base; cilia light brownish-ochreous or fuscous.

Madulsima, Kurunegala, Diyatalawa, Ceylon (Green, Vaughan, Pole, Fletcher); from July to November, eight specimens. The characteristic apical dot separates it from all allied species.

Brachmia isocrypta, n. sp.

♀. 15 mm. Head and thorax rather dark fuscous, face paler. Palpi whitish, second joint dark fuscous except apex, anterior edge of terminal joint blackish. Antennæ 1, white ringed with dark fuscous. Abdomen fuscous, apex ochreous-tinged, beneath whitish with anal tuft blackish. Posterior tibiæ white, basal third and a præapical mark dark fuscous, tarsi white with three dark fuscous rings. Forewings elongate, rather narrow, posteriorly slightly dilated, costa gently arched, apex obtuse, termen slightly sinuate, rather oblique; 3 and 4 out of 2, 7 to apex, 8 and 9 out of 7; rather dark fuscous; second discal stigma obscurely darker; a cloudy fuscous-whitish dot on costa at $\frac{3}{4}$, whence a very faintly indicated very obtusely angulated pale line runs to dorsum before tornus: cilia fuscous with two darker shades, on termen with pale basal line. Hindwings and cilia grey.

Maskeliya, Ceylon (Pole); in June, one specimen.

Brachmia iresia, n. sp.

♂ ♀. 9-14 mm. Head ochreous-whitish, crown in ♀ sometimes grey. Palpi ochreous-white, second joint more or less suffused with fuscous or dark

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fuscous except towards apex, anterior edge of terminal joint dark fuscous. Antennæ 1, ochreous-whitish, in ♀ dotted with dark grey on basal half, in ♂ simple. Thorax purplish-grey. Abdomen grey, beneath whitish. Posterior tibiæ ochreous-white, basal half dark grey, tarsi ochreous-white, more or less marked or banded with dark fuscous. Forewings elongate, rather narrow, costa slightly arched, apex obtuse, termen slightly sinuate, oblique; 2 and 3 stalked, 7 to apex, 8 and 9 out of 7; dark purplish-grey; stigmata represented by small obscure darker spots, sometimes nearly obsolete, plical somewhat beyond first discal, second discal transverse-oval; a small whitish mark on costa at $\frac{3}{4}$, whence sometimes a faint slightly curved line of whitish scales runs to tornus: cilia on costa and tornus dark purplish-grey, on termen white, in ♂ with a black basal line, in ♀ with base purplish-grey and a blackish subbasal shade. Hindwings grey; cilia light grey, in ♂ suffused with whitish on upper part of termen.

Madulsima, Trincomali, Puttalam, Ceylon (Pole, Fletcher); N. Coorg, 3,500 feet (Newcome); in February and from June to November, nine specimens. *B. orbata*, Meyr., from Borneo is a very similar species, but has posterior tibiæ wholly grey.

Brachmia argocrossa, n. sp.

♂ ♀. 16-18 mm. Head pale whitish-ochreous, crown sometimes suffused posteriorly with light brownish or fuscous. Palpi ochreous-white, second joint dark fuscous except apex, anterior edge of terminal joint blackish. Antennæ 1, pale whitish-ochreous, in ♂ simple. Thorax purplish-fuscous. Abdomen whitish-ochreous. Posterior tibiæ whitish, somewhat sprinkled on sides with dark fuscous, tarsi whitish with slight dark grey dots at base of joints. Forewings elongate, rather narrow, slightly dilated posteriorly, costa gently arched, apex obtuse, termen somewhat sinuate, rather oblique; 3 and 4 out of 2, 7 to apex, 8 and 9 out of 7; purplish-fuscous; stigmata black, plical rather obliquely beyond first discal; a whitish dot on costa at $\frac{3}{4}$, whence sometimes a very faint pale curved or bent line runs to $\frac{2}{3}$ of dorsum; a blackish terminal line: cilia ochreous-white, on costa dark purplish-fuscous, on tornus fuscous. Hindwings grey; an oblique dark grey discal mark; cilia whitish-ochreous. Undersurface of hindwings ochreous-whitish irregularly mottled with dark fuscous, with an oblique dark fuscous discal mark.

Maskeliya, Ceylon (Pole); in January, February, June, July, and October, six specimens.

Brachmia arcifera, Meyr.

Palni Hills (Campbell); Bhotan (Dudgeon). The abdomen should be described as dark fuscous.

Brachmia bracculata, n. sp.

♂ ♀. 15-17 mm. Head and thorax rather dark lilac-fuscous, face suffused with ochreous-whitish. Palpi ochreous-whitish second joint sprinkled

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and on basal half suffused with dark fuscous, anterior edge of terminal joint dark fuscous. Antennæ dark fuscous, dotted with whitish, ciliations in ♂ $\frac{3}{4}$. Abdomen rather dark fuscous, tinged with ochreous, beneath yellow-whitish except anal segment. Posterior tibiæ ochreous-whitish, basal $\frac{2}{3}$ dark fuscous, tarsi dark fuscous, ringed with whitish. Forewings elongate rather narrow, slightly dilated posteriorly, costa gently arched, apex obtuse, termen sinuate, rather oblique ; 2 and 3 stalked, 7 to termen, 8 and 9 out of 7 ; rather dark purplish-fuscous ; second discal stigma obscurely darker ; ochreous-white wedge-shaped strigulæ on costa at $\frac{3}{4}$ and dorsum before tornus, connected by a faint sinuate whitish line : cilia bronzy-fuscous, base on termen white followed by a dark grey shade. Hindwings rather dark grey ; cilia pale grey, on upper part of termen with base ochreous-whitish.

Khasis ; in May and September, three specimens.

Brachmia deleastra, n. sp.

♀. 15-17mm. Head and thorax rather dark fuscous, face paler or whitish-tinged. Palpi whitish, second joint fuscous except apex, with a dark fuscous subapical ring, anterior and posterior edges of terminal joint blackish. Antennæ 1, ochreous-white ringed with dark fuscous. Abdomen fuscous. Posterior tibiæ dark fuscous, apex yellowish-white, tarsi yellowish-white spotted with dark fuscous. Forewings elongate, rather narrow, posteriorly slightly dilated, costa gently arched, apex round-pointed, termen concave, rather oblique ; 2 and 3 stalked, 7 to termen, 8 and 9 out of 7 ; moderately dark purple-fuscous ; stigmata obscurely darker, plical, hardly beyond first discal, second discal forming a transverse mark ; a somewhat oblique ochreous-whitish mark on costa at $\frac{3}{4}$, whence a faintly indicated very obtusely angulated pale line runs to dorsum before tornus ; a dark terminal line : cilia rather dark purplish-fuscous, with pale basal line. Hindwings and cilia fuscous.

Kandy and Arawa, Ceylon (Green, Pole, Fletcher) ; in August and December, three specimens.

Brachmia storestis, n. sp.

♂. 10 mm. Head pale whitish-ochreous, centre of crown pale fuscous. Palpi ochreous-whitish, second joint suffused with dark fuscous except towards apex. Antennæ almost 1, ochreous-whitish, serrulate, simple. Thorax rather dark fuscous. Abdomen fuscous, beneath dark fuscous, anal tuft pale whitish-ochreous. Posterior tibiæ rather dark fuscous, apex whitish, with an expansible pencil of yellow-whitish hairs from base above, tarsi ochreous-white. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen almost straight, oblique ; 2 and 3 stalked, 7 to apex, 8 and 9 out of 7 ; dark fuscous ; stigmata represented by small cloudy blackish spots, plical elongate, rather before first discal ; a small oblique

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whitish mark on costa at $\frac{2}{3}$; a cloudy blackish terminal line: cilia fuscous mixed with dark fuscous, base suffused with pale ochreous on termen. Hindwings grey; cilia light grey, base ochreous-whitish.

Maskeliya, Ceylon (Alston); in December, one specimen.

Brachmia metasaris, n. sp.

♂ ♀. 17-18 mm. Head and thorax rather dark purplish-fuscous, crown with a white line above eyes, face suffused with whitish-ochreous. Palpi whitish, second joint suffused with dark fuscous except towards apex, anterior edge of terminal joint blackish. Antennæ 1, whitish, basal joint with a dark fuscous line, ciliations in ♂ $\frac{1}{2}$. Abdomen light fuscous, beneath darker fuscous, anal tuft in ♂ ochreous-whitish, internally yellowish. Posterior tibiæ fuscous, apex whitish, in ♂ clothed above with expansible brush of very long whitish hairs, tarsi whitish. Forewings elongate, rather narrow, slightly dilated posteriorly, costa gently arched, apex round-pointed, termen sinuate, rather oblique; 2 and 3 stalked, 7 to apex, 8 and 9 out of 7; rather dark fuscous, faintly purplish-tinged; an ochreous-whitish dot on costa at $\frac{3}{4}$; a dark fuscous terminal line: cilia fuscous, on termen with basal line whitish-ochreous and tips whitish. Hindwing fuscous; cilia whitish-ochreous, with two more or less marked fuscous shades.

Khasis; in May, two specimens.

Brachmia corsota, n. sp.

♂ ♀. 20-22 mm. Head and thorax rather dark purplish-fuscous, face and sides of crown more or less suffused with whitish-yellowish. Palpi pale ochreous-yellowish, second joint suffused with dark fuscous except towards apex, anterior and posterior edges of terminal joint blackish. Antennæ 1, whitish-ochreous, basal joint with a dark fuscous line, ciliations in ♂ minute. Abdomen light fuscous, beneath dark purplish-fuscous, anal tuft ochreous-yellowish. Posterior tibiæ dark fuscous, apex ochreous-whitish, tarsi ochreous-whitish banded with dark fuscous irroration. Forewings elongate, rather narrow, posteriorly somewhat dilated, costa gently arched, apex round-pointed, termen sinuate, rather oblique; 2 and 3 stalked, 7 to termen, 8 and 9 out of 7; rather dark fuscous, faintly purplish-tinged; an ochreous-whitish dot on costa at $\frac{3}{4}$: cilia fuscous, on termen with apical fourth white. Hindwings fuscous; cilia pale ochreous-fuscous.

Khasis; in March and September, three specimens. Very like *metasaris*, but larger and pale colouring yellower; structurally different by minute ciliations of antennæ in ♂, and absence of brush of hairs on posterior tibiæ.

Brachmia thraneuta, n. sp.

♂ ♀. 15-19 mm. Head and thorax rather dark bronzy-fuscous, face paler. Palpi ochreous-whitish, second joint dark fuscous except towards apex, anterior and posterior edges of terminal joint dark fuscous. Antennæ

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1, ochreous-whitish ringed with dark fuscous, ciliations in ♂ 1. Abdomen fuscous, beneath dark purplish-fuscous. Posterior tibiæ dark fuscous, apex whitish, tarsi whitish banded with dark fuscous. Forewings elongate, rather narrow, slightly dilated posteriorly, costa slightly arched, apex round-pointed, termen sinuate, rather oblique ; 2 and 3 stalked, 7 to termen, 8 and 9 out of 7 ; rather dark fuscous, faintly bronzy or purplish-tinged ; stigmata obscurely darker, plical rather beyond first discal, second discal forming a transverse mark ; an ochreous-whitish dot on costa at $\frac{3}{4}$, whence a very faint somewhat curved pale line runs to dorsum before tornus ; a blackish terminal line : cilia rather dark fuscous. Hindwings rather dark fuscous ; cilia fuscous.

Maskeliya, Madulsima, Haputale, and Haldamulla, Ceylon (Pole, Vaughan, de Mowbray, Alston) ; N. Coorg, 3,500 feet (Newcome) ; Nilgiris, 3,500 feet (Andrews) ; Palni Hills (Campbell) ; from February to August, fifteen specimens.

Brachmia pellax, n. sp.

♂ ♀. 16-20 mm. Head purplish-fuscous, sides of crown ochreous-yellow. Palpi dark fuscous, apex of second joint and base of terminal pale yellowish. Antennæ 1, pale yellowish faintly ringed with fuscous, ciliations in ♂ 4. Thorax dark purple-fuscous. Abdomen rather dark fuscous. Posterior tibiæ rather dark fuscous, apex yellow-whitish, tarsi yellow-whitish banded with fuscous. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen somewhat sinuate, rather oblique ; 2 and 3 stalked, 7 to apex, 8 and 9 out of 7 ; dark purplish-fuscous, stigmata, cloudy, blackish-fuscous, plical beneath first discal, sometimes suffused with it into an undefined cloudy blotch, second discal forming a transverse somewhat 8-shaped mark ; a small cloudy ochreous-whitish spot on costa at $\frac{4}{5}$, whence a slightly curved obscure ochreous-whitish line runs to dorsum before tornus : cilia rather dark purplish-fuscous, base on termen pale ochreous. Hindwings and cilia grey.

Khasis ; from June to September, three specimens. The unusually long antennal ciliations are a noticeable feature.

Brachmia laxata, n. sp.

♂ ♀. 18-22 mm. Head light violet-fuscous, sides suffused with ochreous-yellowish. Palpi light yellowish, second joint suffused with fuscous except towards apex, terminal joint sometimes variably sprinkled with fuscous. Antennæ 1, pale ochreous, ciliations in ♂ $\frac{3}{4}$. Thorax rather dark purplish-fuscous. Abdomen fuscous, beneath dark purple-fuscous, anal tuft pale ochreous. Posterior tibiæ dark fuscous, apex whitish-yellowish, tarsi whitish-yellowish, basal joint thickened. Forewings elongate, rather narrow, costa slightly arched, apex round-pointed, termen concave, oblique ; 3 very short, out of 2 or absent, 4 out of 2, 7 to termen, 8 and 9 out of 7 ;

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dark purple-fuscous; a large irregular patch of darker suffusion resting on dorsum before middle, sometimes followed by more or less extensive pale ochreous suffusion in disc and towards dorsum, plical and first discal stigmata sometimes indicated on margin of this patch; second discal stigma and an additional spot beneath it distinct in paler-suffused specimens, or confluent and obscure in darker ones; wedgeshaped pale yellow-ochreous costal and dorsal marks near termen, sometimes connected by a faint curved line: cilia dark purple-fuscous, on termen with a pale ochreous basal line. Hindwings fuscous; cilia brownish, in ♀ mixed with dark fuscous towards tips round apex.

Khasis; from July to September, five specimens.

Brachmia sortilega, n. sp.

♂ ♀. 21-23 mm. Head and thorax light brownish-ochreous, face and sides of crown pale yellow-ochreous. Palpi pale yellow-ochreous, second joint suffused with fuscous except towards apex, anterior edge of terminal joint more or less infuscated. Antennæ $\frac{5}{6}$, whitish-ochreous, ciliations in ♂ $\frac{3}{4}$. Abdomen light yellow-ochreous. Posterior legs pale ochreous-yellowish, tibiæ and basal joint of tarsi externally suffused with fuscous. Forewings elongate, posteriorly somewhat dilated, costa slightly arched, faintly sinuate in middle, apex round-pointed, termen sinuate, somewhat oblique; 2 and 3 stalked, 7 to termen, 8 and 9 out of 7; light brownish-ochreous, somewhat sprinkled with fuscous; costal edge ochreous-yellowish except towards base, where it is dark fuscous; stigmata blackish, first discal well-marked, plical obsolete, absorbed in a transverse mark of dark fuscous suffusion from dorsum, second discal represented by two transversely placed sometimes connected dots; a small spot of dark fuscous suffusion on costa somewhat beyond first discal; a wedgeshaped mark of blackish suffusion on costa, whence a rather pale obscure anteriorly fuscous-edged somewhat curved line runs to $\frac{4}{5}$ of dorsum; an interrupted blackish terminal line: cilia light ochreous-fuscous, on termen with broad postmedian dark fuscous shade, on costa ochreous-yellowish. Hindwings pale ochreous tinged with fuscous; cilia light ochreous-yellowish, sometimes more or less strongly infuscated.

Khasis; from May to July, fourteen specimens.

Brachmia octavana, n. sp.

♂ ♀. 22-23 mm. Head and thorax rather dark purplish-fuscous, sides of crown ochreous-yellowish. Palpi pale yellowish, basal $\frac{2}{3}$ of second joint dark fuscous, anterior edge of terminal joint dark fuscous. Antennæ nearly 1, whitish-yellowish, ciliations in ♂ $\frac{3}{4}$. Abdomen grey, anal tuft greyish-ochreous. Posterior legs whitish-ochreous, tibiæ and base of tarsi externally suffused with dark purplish-fuscous. Forewings elongate, osteriorly dilated, cost a gently arched, apex round-pointed, termen

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sinuate, rather oblique; 2 and 3 stalked, 7 to termen, 8 and 9 out of 7; brown, sprinkled with dark fuscous, with a strong purplish gloss; costal edge ochreous-orange; plical and first discal stigmata indicated by two very obscure somewhat lighter ochreous-brown spots, second discal by a similar 8-shaped spot centered with two dark fuscous dots; an obscure ochreous-brown subterminal line, central third somewhat curved outwards: an interrupted blackish terminal line: cilia brownish-ochreous. Hindwings grey; cilia greyish, base pale ochreous.

Khasis; in June, July and October, four specimens.

Brachmia ancylota, Meyr.

Fort Stedman, Burma; Khasis.

Brachmia parallactis, Meyr.

Mone, Burma.

Brachmia characteris, Meyr.

Koni, Burma.

Brachmia spilotella Walk. (*tripustulata*, Wals.)

Peradeniya, Diyatalawa, and Galle, Ceylon.

Brachmia typhlopis, n. sp.

♂ ♀. 22-30 mm. Head and thorax dark purplish-fuscous, sides of head ochreous-yellowish. Palpi whitish-ochreous, basal half of second joint dark fuscous. Antennæ $\frac{5}{6}$, whitish-ochreous, ciliations in ♂ $\frac{3}{4}$. Abdomen fuscous. Posterior tibiæ fuscous, apex whitish-ochreous, tarsi dark fuscous with whitish-ochreous rings at apex of joints. Forewings elongate, posteriorly dilated, costa gently arched, apex obtuse, termen slightly rounded, almost vertical; 2 and 3 stalked, 7 to apex, 8 and 9 out of 7; glossy dark purplish-fuscous; stigmata represented by black spots, first discal small, round, confluent with large trapezoidal plical beneath it, second discal moderate, transverse: cilia fuscous. Hindwings fuscous, in ♀ rather darker; cilia fuscous.

N. Coorg, 3,500 feet (Newcome); in February and September, two specimens. Very near *spilotela*, but antennal ciliations much shorter (in *spilotella* 2), ground colour of forewings darker, and immediately separated by absence of black sub-costal dot near base.

Brachmia syrphetodes, Meyr.

Maskeliya and Namunukuli, Ceylon.

Brachmia artiasta, n. sp.

♀. 22 mm. Head and thorax rather dark purplish-fuscous, sides of crown ochreous-whitish. Palpi ochreous-whitish, second joint fuscous except apex, terminal joint mixed with fuscous except towards extremities. Antennæ $\frac{4}{5}$, ochreous-whitish. (Abdomen broken.) Posterior tibiæ purplish-fuscous, apex ochreous-whitish, tarsi ochreous-whitish. Forewings elongate somewhat dilated posteriorly, costa slightly arched, faintly sinuate in

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middle, apex obtuse, termen nearly straight, somewhat oblique ; 2 and 3 stalked, 7 to apex, 8 and 9 out of 7 ; rather dark purplish-fuscous ; stigmata blackish, plical beneath first discal : cilia light fuscous, tips paler. Hindwings grey ; cilia light grey.

Nilgiris, 3,500 feet (Andrewes) ; in August, one specimen.

Brachmia juridica, n. sp.

♂ ♀. 13-17mm. Head in ♂ whitish-ochreous, in ♀ pale grey sprinkled and on sides suffused with whitish-ochreous. Palpi ochreous-whitish, second joint suffused with dark purplish-fuscous except towards apex, terminal joint in ♀ sprinkled with dark fuscous. Antennæ $\frac{5}{6}$, dark fuscous, in ♂ minutely ciliated. Thorax purplish-grey. Abdomen whitish-ochreous, in ♀ infuscated. Posterior legs pale whitish-ochreous, in ♂ externally sprinkled with fuscous, in ♀ suffused with rather dark fuscous. Forewings elongate, costa gently arched, apex obtuse, termen slightly rounded, rather oblique ; 2 and 3 stalked, 7 and 8 stalked, 7 to apex ; purplish-grey, sprinkled with dark fuscous, more strongly in ♀ ; stigmata dark fuscous, plical somewhat before first discal ; a spot of dark fuscous suffusion on dorsum before tornus : cilia purplish-grey, sprinkled with dark fuscous towards base. Hindwings grey darker in ♀ ; cilia light grey.

Trincomali, Ceylon (Fletcher) ; in June, three specimens.

Brachmia elephantopa, Meyr.

Purneah, Bengal ; Konkan ; N. Coorg, 3,500 feet ; Nilgiris, 3,500 feet.

Brachmia hæmylopis, n. sp.

♂ ♀. 15-17 mm. Head and thorax dark fuscous, sides of crown slightly sprinkled with grey-whitish points. Palpi whitish, second joint dark fuscous except apex, terminal joint more or less sprinkled or mixed with dark fuscous. Antennæ $\frac{5}{6}$, dark fuscous, in ♂ simple. Abdomen fuscous. Posterior tibiæ pale whitish-ochreous, externally suffused with dark fuscous, tarsi pale whitish-ochreous more or less banded with dark fuscous. Forewings elongate, rather narrow, somewhat dilated posteriorly, costa slightly arched, apex obtuse, termen slightly rounded, rather oblique ; 2 and 3 stalked, 7 and 8 stalked, 7 to apex ; dark fuscous, slightly purplish-tinged ; stigmata black, plical slightly beyond first discal, both these edged posteriorly with a few white scales, second discal mixed with white scales ; an obscure pale whitish-ochreous dot on costa at $\frac{4}{5}$, with traces of a very faint sinuate transverse line from it : cilia fuscous, base on termen pale greyish-ochreous. Hindwings and cilia grey.

Madulsima, Ceylon (Vaughan, Green) ; in April, and from September to December, seven specimens. The mixture of black and white in second discal stigma is a characteristic feature.

Brachmia puteolata, n. sp.

♂. 21-23 mm. Head and thorax dark fuscous, sides of head sprinkled

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with pale points. Palpi dark fuscous, terminal joint ochreous-whitish suffused with dark fuscous at base and sometimes partially on sides, Antennæ 1, dark fuscous, simple. Abdomen whitish-ochreous tinged with fuscous. Posterior tibiæ whitish-ochreous, externally suffused with dark fuscous, tarsi dark fuscous with whitish-ochreous rings at apex of joints. Forewings elongate, rather dilated posteriorly, costa gently arched, apex obtuse, termen slightly rounded, little oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to apex; dark fuscous, slightly purplish-tinged; stigmata represented by small blackish spots, plical rather obliquely before first discal, both these edged posteriorly with ochreous-whitish suffusion, second discal similarly edged on both sides: cilia purplish-fuscous. Hindwings whitish-fuscous, becoming fuscous towards termen and apex; cilia whitish-ochreous with two fuscous shades.

Cuddapah, 4,000 feet (Campbell); two specimens.

Brachmia geræa, n. sp.

♂ ♀. 16-19 mm. Head whitish-ochreous. Palpi ochreous-whitish, basal half of second joint dark fuscous, terminal joint more or less wholly dark fuscous from below middle to near apex. Antennæ almost 1, dark fuscous, in ♂ simple. Thorax dark fuscous. Abdomen fuscous tinged with yellowish, anal tuft whitish-ochreous, beneath suffused with whitish-ochreous. Posterior tibiæ ochreous-whitish, externally suffused with dark fuscous, tarsi ochreous-whitish, more or less banded with dark fuscous. Forewings elongate, rather dilated posteriorly, costa slightly arched, apex obtuse, termen slightly rounded, rather oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to apex, 9 often out of 7; dark fuscous, faintly purplish-tinged; stigmata cloudy, blackish, plical somewhat beyond first discal, both more or less edged posteriorly with pale fuscous or ochreous, second discal and an additional dot beneath it more or less edged with pale fuscous or ochreous so as to form an 8-shaped mark; an obscure pale ochreous mark on costa at $\frac{4}{5}$, whence sometimes a faint sinuate pale line indented above middle crosses wing: cilia fuscous, basal line on termen pale ochreous. Hindwings and cilia grey.

Madulsima, Ceylon (Vaughan, Green); in April, May, and from September to November, thirteen specimens. Of these seven have vein 9 of forewings out of 7, and six have it separate. The whitish-ochreous head distinguishes this species from those most like it.

Brachmia lycopis, n. sp.

♂ ♀. 19 mm. Head dark fuscous, sides suffused with brownish-ochreous. Palpi pale whitish-ochreous, sprinkled with dark fuscous, lower half of second joint suffused with dark fuscous, terminal joint with median and subapical dark fuscous bands. Antennæ 1, dark fuscous, in ♂ simple. Thorax dark fuscous. Abdomen grey. Posterior tibiæ dark fuscous, apex

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pale whitish-ochreous, tarsi pale whitish-ochreous banded with dark fuscous. Forewings elongate, costa gently arched, apex obtuse, termen rounded, rather oblique ; 2 and 3 stalked, 7 and 8 stalked, 7 to apex ; dark fuscous, slightly purplish-tinged ; stigmata brownish or pale brownish-ochreous edged with some blackish scales, plical slightly beyond first discal, both these small, second discal rather large : cilia purplish-fuscous, base mixed with darker. Hindwings and cilia grey.

Maskeliya and Madulsima, Ceylon (de Mowbray, Green) ; in November, January, and May, three specimens.

Brachmia isomila, n. sp.

♂. 20-22 mm. Head and thorax dark fuscous. Palpi pale ochreous, second joint dark fuscous except extreme apex, anterior edge of terminal joint suffused with dark fuscous. Antennæ almost 1, dark fuscous, simple. Abdomen fuscous, anal tu ft pale ochreous. Posterior legs pale ochreous tibiæ externally suffused with fuscous or dark fuscous. Forewings elongate, posteriorly dilated, costa gently arched, apex obtuse, termen nearly straight, oblique ; 2 and 3 stalked, 7 and 8 stalked, 7 to apex ; dark bronzy-fuscous ; stigmata obscurely darker, plical slightly beyond first discal, second discal forming a transverse-linear mark : cilia fuscous, with two darker shades. Hindwings fuscous ; cilia as in forewings.

Maskeliya, Ceylon (Pole) ; in April, two specimens.

Brachmia paroristis, n. sp.

♂. 24-25 mm. Head and thorax dark fuscous, sides of crown pale-sprinkled. Palpi ochreous-whitish, second joint dark fuscous except towards apex, terminal joint sprinkled with dark fuscous. Antennæ 1, dark fuscous, simple. Abdomen rather long, fuscous. Posterior tibiæ whitish-ochreous, externally suffusedly mixed with dark fuscous, tarsi whitish-ochreous somewhat sprinkled with dark fuscous. Forewings elongate, somewhat dilated posteriorly, costa gently arched, apex rounded-obtuse, termen slightly rounded, rather oblique ; 2 and 3 stalked, 7 and 8 stalked, 7 to apex ; dark fuscous, faintly purplish-tinged, towards middle third of costa more or less suffused with pale ochreous-fuscous ; stigmata blackish, first discal forming a small oblique spot, plical a larger irregular spot beneath it, both these more or less edged posteriorly with pale ochreous, second discal represented by two transversely placed dots edged with pale ochreous so as to form an 8-shaped mark ; a cloudy pale ochreous-fuscous rather curved subterminal line, thicker and more distinct on costa, indented beneath costa : cilia fuscous, with rows of pale points. Hindwings fuscous-grey ; cilia light fuscous.

Madulsima, Ceylon (Vaughan) ; in May and June, two specimens. Much like *epomia*, which however has termen of forewings somewhat sinuate, and antennæ of ♂ distinctly ciliated ($\frac{1}{2}$).

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Brachmia epomia, Meyr.

Maskeliya and Patipola, Ceylon.

Brachmia capnaula, n. sp.

♂ ♀. 20-22 mm. Head pale ochreous, face brownish-tinged. Palpi ochreous-whitish, second joint dark fuscous except apex, with scales rather roughly expanded above towards apex, terminal joint with subapical band of dark fuscous suffusion. Antennæ $\frac{2}{3}$, fuscous, ciliations in ♂ $\frac{2}{3}$. Thorax purplish-fuscous, shoulders darker fuscous. Abdomen pale greyish-ochreous. Posterior legs ochreous-whitish, tibiæ externally suffused with dark fuscous. Forewings elongate, rather dilated posteriorly, costa slightly arched, apex obtuse, termen nearly straight, oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to apex; brownish, variable in depth, veins usually more or less marked with irregular streaks of coarse dark fuscous irroration; stigmata dark fuscous, plical beneath first discal, second discal larger, transverse-oval, but these are sometimes merged in more or less developed thick cloudy dark fuscous longitudinal streaks through middle of disc and along fold; a pale cloudy subterminal line formed by interruption of dark streaks on veins, somewhat indented above middle, terminal area beyond this often suffused with dark fuscous: cilia light greyish-ochreous, with two dark fuscous shades. Hindwings grey; cilia as in forewings.

Patipola, Newera Eliya, Maskeliya, and Haputale, Ceylon (Pole, Green, Alston); from February to April, eleven specimens. The structure of the palpi is peculiar, but in all other respects the species clearly belongs here and cannot be separated.

Brachmia fornacalis, n. sp.

♂ ♀. 17-19 mm. Head bronzy-fuscous, more or less suffused with whitish-ochreous on sides. Palpi ochreous-whitish, second joint suffused with dark fuscous except towards apex, terminal joint with subapical band of dark fuscous suffusion. Antennæ almost 1, dark fuscous, in ♂ simple. Thorax dark purplish-fuscous. Abdomen fuscous. Posterior legs whitish-ochreous, tibiæ externally suffused with dark fuscous, tarsi banded with dark fuscous suffusion. Forewings elongate, posteriorly dilated, costa slightly arched, apex obtuse, termen faintly sinuate, oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to termen; rather dark purplish-fuscous, in ♂ lighter in disc; stigmata represented by blackish-fuscous spots, first discal small, roundish, plical beneath it, larger, irregular, these two edged with whitish-ochreous posteriorly and sometimes confluent, second discal represented by two small transversely placed spots, connected and upper edged laterally with whitish-ochreous; in ♂ a distinct whitish-ochreous slightly curved transverse line at $\frac{4}{5}$, dilated on costa, indented above middle, in ♀ represented by costal spot only: cilia fuscous, in ♂ with whitish-ochreous basal line on termen. Hindwings and cilia fuscous.

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Kandy, Ceylon (Mackwood); in January, two specimens.

Brachmia exophthalma, n. sp.

♂ ♀. 17-21 mm. Head and thorax rather dark purplish-fuscous, sides of head suffused with pale ochreous. Palpi ochreous-whitish, second joint dark fuscous except apex. Antennæ 1, rather dark fuscous, in ♂ simple. Abdomen pale ochreous, in ♀ infuscated. Posterior legs whitish-ochreous, tibiæ externally suffusedly mixed with dark fuscous. Forewings elongate, rather narrow at base, posteriorly dilated, costa gently arched, apex obtuse, termen almost straight, oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to apex; purplish-fuscous, rather darker in ♀; an elongate black dot beneath costa near base; plical and first discal stigmata united into a transverse-oval blackish blotch, edged posteriorly with whitish-ochreous, and second discal represented by a quite similar blotch, edged on both sides; a black dot lying between upper extremities of these; an indistinct pale ochreous somewhat curved subterminal line, dilated and distinct on costa, indented beneath costa: cilia in ♂ whitish-ochreous with two obscure fuscous shades, in ♀ fuscous. Hindwings in ♂ light grey, in ♀ grey; cilia as in forewings.

Maskeliya, Ceylon (Pole, de Mowbray); in January, April and October, four specimens.

Brachmia cordata, n. sp.

♂. 18 mm. Head dark fuscous, sprinkled with pale points. Palpi ochreous-whitish, second joint suffused with dark fuscous except apex, terminal joint mixed with dark fuscous. Antennæ nearly 1, dark fuscous, simple. Thorax dark fuscous. Abdomen pale ochreous. Posterior legs whitish-ochreous, tibiæ externally suffused with dark fuscous, tarsi banded with dark fuscous. Forewings elongate, slightly dilated posteriorly, costa gently arched, apex obtuse, termen somewhat rounded, oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to apex; purplish-fuscous, irrorated with blackish, more strongly and suffusedly towards base, along costa, and on terminal area; a streak of ochreous-whitish suffusion along dorsum from $\frac{1}{3}$ to $\frac{3}{4}$; stigmata represented by cloudy blackish spots, first discal roundish, plical beneath this, larger, irregular, both these irregularly edged posteriorly with white, second discal transverse-oval, edged posteriorly and slightly anteriorly with white; a strong whitish-ochreous subterminal line, indented on upper half: cilia fuscous, with rows of whitish points, and a darker antemedian shade. Hindwings fuscous-whitish, gradually more infuscated posteriorly; cilia fuscous-whitish, with fuscous subbasal shade.

Palni Hill (Campbell); one specimen.

Brachmia nubigena, n. sp.

♂. 17 mm. Head ochreous-whitish, face fuscous. Palpi ochreous, whitish, second joint dark fuscous except towards apex, terminal joint sprinkled with dark fuscous towards apex. Antennæ nearly 1, dark fuscous,

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minutely ciliated. Thorax dark purplish-fuscous. Abdomen pale greyish-ochreous. Posterior legs ochreous-whitish, tibiæ externally suffused with dark fuscous. Forewings elongate, rather dilated posteriorly, costa gently arched, apex obtuse, termen faintly sinuate, oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to apex; dark purplish-fuscous; stigmata cloudy, blackish, plical slightly beyond first discal; a small pale ochreous spot on costa at $\frac{4}{5}$, and a minute dot on dorsum before tornus: cilia fuscous, with darker subbasal shade. Hindwings light fuscous; cilia fuscous-whitish, with two light fuscous shades.

Haputale, Ceylon (Fletcher); in August, one specimen.

Brachmia citrostrota, n. sp.

♂ ♀. 15-17 mm. Head dark purplish-fuscous, face and sides of crown ochreous-yellowish. Palpi ochreous-yellowish, second joint sprinkled with dark fuscous, terminal joint with a suffused dark fuscous streak on each side. Antennæ 1, ochreous-yellowish, suffusedly spotted with dark fuscous, in ♂ simple. Thorax dark purplish-fuscous, with an ochreous-yellowish line on each side of back. Abdomen rather dark fuscous, in ♂ with margins of segments towards apex spotted with pale yellowish, anal tuft light yellowish. Posterior tibiæ dark fuscous with basal, median, and apical pale yellowish marks, tarsi pale yellowish more or less variably sprinkled with dark fuscous. Forewings elongate, rather narrow, costa slightly arched, faintly sinuate in middle, apex obtuse, termen sinuate, oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to termen; rather dark fuscous mixed with blackish, faintly purplish-tinged; undefined longitudinal streaks of ochreous-yellowish suffusion or irroration above and below middle, confluent posteriorly into a moderately broad irregular subterminal transverse fascia; five small pale yellowish spots on posterior half of costa; stigmata represented by round spots of blackish suffusion, plical rather obliquely beyond first discal: cilia purplish-fuscous mixed with darker, on termen with basal and apical pale yellowish lines, basal third narrowly barred with pale yellowish. Hindwings rather dark grey; cilia grey with basal and apical ochreous-whitish lines.

Khasis; in May, eighteen specimens.

Brachmia cenchritis, n. sp.

♂ ♀. 16 mm. Head and thorax light ochreous-yellowish sprinkled with dark fuscous except on face. Palpi whitish-ochreous sprinkled with dark fuscous. Antennæ 1, whitish-ochreous, sprinkled or spotted with dark fuscous, in ♂ simple. Abdomen whitish-ochreous, sprinkled with dark fuscous on sides. Posterior legs ochreous-whitish suffusedly sprinkled with dark fuscous. Forewings elongate, rather narrow, costa gently arched, faintly sinuate in middle, apex round-pointed, termen sinuate, oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to apex; ochreous-whitish, irregularly strewn

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with ochreous or brownish scales with black tips; stigmata represented by spots formed of accumulations of similar scales, first discal round, second large, roundish, plical elongate, somewhat before first discal; four small spots of similar scales on posterior half of costa, and a suffused streak close before termen: cilia ochreous-whitish sprinkled with blackish, basal third pale yellowish. Hindwings ochreous-whitish, somewhat sprinkled with grey, especially towards apex; cilia as in forewings.

Khasis; in April, two specimens.

Brachmia strangalistis, n. sp.

♂ ♀. 16 mm. Head light ochreous-yellowish, centre of crown tinged with purplish-fuscous. Palpi pale ochreous-yellowish, anterior edge of terminal joint dark fuscous. Antennæ 1, whitish-yellowish, obscurely dotted with fuscous, in ♂ simple. Thorax lilac-brownish. Abdomen light ochreous. Posterior tibiæ fuscous, apex pale yellowish, tarsi pale yellowish suffusedly banded with fuscous. Forewings elongate, rather narrow, costa slightly arched, slightly sinuate in middle, apex round-pointed, termen faintly sinuate, oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to termen; brownish, sprinkled with dark fuscous; stigmata represented by spots of dark fuscous suffusion, first discal round, second transverse-oval, plical smaller, beneath first discal; posterior half of costa suffused with dark fuscous, interrupted by an ochreous-yellowish patch towards apex, the obscure dark suffusion extending along upper part of termen: cilia whitish-ochreous tinged with brownish, with a dark fuscous postmedian shade. Hindwings ochreous-whitish-grey, becoming grey towards apex; cilia whitish-ochreous, with two faint greyish shades.

Khasis; in April, August, and October, three specimens.

Brachmia phryganitis, n. sp.

♂ ♀. 16-18 mm. Head whitish-ochreous. Palpi ochreous-whitish, second joint sprinkled with fuscous. Antennæ $\frac{4}{5}$, fuscous, ciliations in ♂ 1. Thorax whitish-ochreous, patagia more or less infuscated. Abdomen whitish-ochreous. Posterior legs ochreous-whitish, more or less sprinkled with fuscous. Forewings elongate, rather narrow, posteriorly slightly dilated, costa gently arched, apex obtuse, termen slightly rounded, oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to apex; ochreous-whitish irregularly mixed with fuscous, suffusedly streaked with brown between veins, these streaks in disc and towards base marked with lines of black scales; a blackish dot towards costa before middle; stigmata black, discal connected by a black streak which is extended to apex, thickest posteriorly, plical represented by an elongate mark; a patch of blackish irroration about fold beyond middle: cilia ochreous-whitish mixed with pale fuscous, at apex with a blackish bar, on termen with basal third spotted with blackish. Hindwings pale grey; cilia ochreous-whitish.

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Maskeliya and Madulsima, Ceylon (Pole, Alston, de Mowbray, Vaughan); from November to January, and May to August, eleven specimens.

Brachmia arotræa, Meyr.

Maskeliya and Ambulangoda, Ceylon; Palni Hills, 6,000 feet; N. Coorg, 3,500 feet; Khasis; Koni, Burma.

Brachmia xerastis, Meyr.

Mooltan, Punjab.

Brachmia aruritis, n. sp.

♂ ♀. 11-13 mm. Head fuscous sprinkled with pale greyish-ochreous. Palpi ochreous-whitish irrorated with dark fuscous. Antennæ $\frac{4}{5}$, dark fuscous, ciliations in ♂ 1. Thorax fuscous. Abdomen grey, anal tuft whitish-ochreous. Posterior legs pale whitish-ochreous, externally mixed with fuscous. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen rounded, oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to apex; rather dark purplish-fuscous, veins marked by lines of black irroration, partially and variably edged with whitish-ochreous dashes and lines, especially subcostal and plical lines towards base, and a subterminal series of dashes; stigmata obscure, blackish, partially edged with whitish-ochreous, plical elongate, all tending to be merged in the dark streaks: cilia dark fuscous with rows of whitish-ochreous points, base barred with whitish-ochreous. Hindwings grey; cilia light grey.

Maskeliya, Matale, Puttalam, and Trincomali, Ceylon (Pole, de Mowbray, Fletcher); in December and January and from April to August, nine specimens.

Brachmia percnobela, n. sp.

♀. 17-19 mm. Head, palpi, antennæ, and thorax dark fuscous, antennæ $\frac{4}{5}$. Abdomen fuscous. Posterior tibiæ light greyish-ochreous, externally suffused with rather dark fuscous. Forewings elongate, rather narrow, costa slightly arched, apex obtuse, termen slightly rounded, rather oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to apex; dark ashy-fuscous, veins obscurely marked with blackish; stigmata obscure, blackish, plical dash-like, rather before first discal, which is also rather elongate: cilia dark ashy-fuscous. Hindwings and cilia grey.

Nilgiris, 3,500 feet (Andrewes); in August, two specimens. Specially characterised by the wholly dark fuscous palpi.

Brachmia lochistis, n. sp.

♂ ♀. 12-13 mm. Head and thorax fuscous, face paler, margins of eyes pale ochreous. Palpi pale whitish-ochreous, second joint sprinkled with fuscous, anterior edge of terminal joint fuscous. Antennæ $\frac{4}{5}$, rather dark fuscous, ciliations in ♂ 1. Abdomen fuscous, anal tuft mixed with ochreous-whitish. Posterior legs grey-whitish. Forewings elongate, rather narrow, costa slightly arched, apex obtuse, termen nearly straight, oblique; 2 and 3

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stalked, 7 and 8 stalked, 7 to apex; rather dark fuscous, faintly purple-tinged; stigmata cloudy, blackish, plical beneath first discal, larger, suffused, preceded by some white scales; a pale whitish-ochreous spot on costa at $\frac{3}{4}$; a terminal series of indistinct dark fuscous dots: cilia pale brownish with rows of whitish-ochreous points, basal third whitish-ochreous, barred with rather dark fuscous on costa, tips and a patch beneath tornus mixed with dark fuscous. Hindwings grey; cilia light grey.

Maskeliya and Puttalam, Ceylon (Pole); N. Coorg, 3,500 feet (Newcome); from December to February and in May, five specimens.

Brachmia hapalyntis, n. sp.

♂ ♀. 10-12 mm. Head and thorax pale ochreous, sometimes tinged or sprinkled with fuscous. Palpi ochreous-whitish, second joint sprinkled with fuscous. Antennæ $\frac{5}{6}$, pale ochreous suffusedly ringed with dark fuscous, in ♂ simple. Abdomen light grey. Posterior legs pale whitish-ochreous, sprinkled with fuscous. Forewings elongate, rather narrow, costa gently arched, apex round-pointed, termen very obliquely rounded; 2 and 3 stalked, 7 and 8 stalked, 7 to apex, 9 sometimes out of 7 near base; pale ochreous, irregularly clouded with brownish and sprinkled with dark fuscous; stigmata moderately large, round, black, edged with white, plical beneath first discal; a terminal series of black dots: cilia whitish-ochreous, basal half obscurely barred with brownish. Hindwings pale grey; cilia pale whitish-ochreous tinged with grey.

Puttalam, Ceylon (Pole); N Coorg, 3,500 feet (Newcome); in May and December, six specimens.

Brachmia sigillatrix, Meyr.

Cochin; Kanara.

Brachmia autonoma, Meyr.

Cochin; Purneah, Bengal; Chagos Island.

Brachmia episticta, Meyr.

Maskeliya, Ceylon.

Brachmia carphodes, Meyr.

Khasis.

Brachmia dolosa, n. sp.

♂ ♀. 10-12 mm. Head whitish-ochreous. Palpi ochreous-whitish, second joint suffusedly irrorated with dark fuscous except apex. Antennæ $\frac{4}{5}$, whitish-ochreous suffusedly dotted with dark fuscous, ciliations in ♂ $\frac{2}{3}$. Thorax whitish-ochreous sprinkled with fuscous and dark fuscous. Abdomen whitish-ochreous. Posterior legs ochreous-whitish sprinkled with dark fuscous. Forewings elongate, costa m derately arched, apex round-pointed, termen faintly sinuate, very oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to termen; whitish-ochreous, more or less sprinkled with brownish and dark fuscous; stigmata formed of blackish irroration, plical rather

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obliquely before first discal; a small transverse spot of blackish irroration on dorsum somewhat before second discal; an acutely angulated series of cloudy black dots close before posterior third of costa and termen: cilia whitish-ochreous, sprinkled with dark fuscous points. Hindwings with upper part of termen hardly sinuate, very oblique, median curve gentle and little prominent, cilia 1; light grey; cilia whitish-ochreous.

Peradeniya, Ceylon (Green); in February, four specimens. Extremely like *alienella*, but smaller and paler, termen of forewings more oblique; best distinguished by form of hindwings, which in *alienella* are broader, more trapezoidal, with upper part of termen distinctly sinuate and less oblique, median curve stronger and more prominent, cilia $\frac{3}{4}$.

Brachmia alienella, Walk.

Maturatta and Madulsima, Ceylon.

Brachmia metœca, Meyr.

Maskeliya, Diyatalawa, Madulsima, and Trincomali, Ceylon.

Brachmia custos, n. sp.

♀. 19 mm. Head pale yellow-ochreous. Palpi pale yellowish, second joint dark fuscous except apex, terminal joint slightly sprinkled with dark fuscous. Antennæ $\frac{4}{5}$, rather dark fuscous. Thorax dark fuscous. Abdomen fuscous, apex light yellow-ochreous. Posterior tibiæ ochreous-whitish, externally somewhat sprinkled with fuscous, tarsi whitish-yellowish. Forewings elongate, costa gently arched, apex obtuse, termen nearly straight, oblique; 2 and 3 stalked, 7 and 8 stalked, 7 to apex; dull ochreous-brown; a basal fascia of rather dark fuscous suffusion; costa infuscated from this to beyond middle; a broad fascia of rather dark fuscous suffusion beyond middle, second discal stigma forming small round dark fuscous spot on inner edge of this: cilia fuscous sprinkled with dark fuscous, with series of whitish-ochreous points, basal third suffused with whitish-ochreous. Hindwings grey; cilia whitish-grey-ochreous with several obscure fuscous lines.

Nilgiris, 6,000 feet, in May (Andrewes); one specimen.

Autosticha vicularis, n. sp.

♂ ♀. 9-12 mm. Head and thorax pale ochreous, sometimes sprinkled with dark fuscous. Palpi whitish-ochreous, second joint sprinkled with blackish, with a more distinct subapical ring, terminal joint with supramedian band of blackish irroration. Antennæ whitish-ochreous dotted with blackish, ciliations in ♂ $\frac{3}{4}$. Abdomen whitish-ochreous tinged with grey. Forewings elongate, costa gently arched, apex obtuse, termen obliquely rounded; pale ochreous, more or less sprinkled with dark fuscous; stigmata black, plical rather obliquely before first discal, second discal sometimes rather large; a small spot of blackish suffusion on dorsum beneath second discal; a row of cloudy blackish dots close before posterior third of costa

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and termen: cilia pale ochreous, with a few dark fuscous points. Hindwings grey; cilia whitish-ochreous tinged with grey.

Galle, Ceylon (Fletcher); in June, thirteen specimens. Extremely like *Brachmia dolosa*, but (besides the generic difference of neuration) apex of forewings more obtuse, termen less oblique, terminal joint of palpi with blackish supramedian band. The species are so similar in size, colour, and markings that they are scarcely distinguishable if these points are not noticed.

Ischnodoris, n. g.

Head with appressed scales, sidetufts loosely spreading; ocelli present; tongue developed. Antennæ $\frac{4}{5}$, in ♂ shortly ciliated, basal joint moderately elongate, without pecten. Labial palpi very long, recurved, second joint with appressed scales, terminal joint as long as second, slender, acute. Maxillary palpi very short, filiform, appressed to tongue. Posterior tibiæ clothed with rough scales above. Forewings with 2 and 3 stalked, 6 absent, 7 and 8 stalked, 7 to termen, 11 from middle. Hindwings 1, elongate-ovate, cilia $1\frac{1}{4}$; 3 and 4 connate, 5 somewhat approximated, 6 and 7 stalked.

Allied to *Brachmia*, of which it is a development.

Ischnodoris sigalota, n. sp.

♂ ♀. 11-12 mm. Head ochreous-whitish, more or less sprinkled and sides of face suffused with fuscous. Palpi whitish, second joint fuscous except apex, apex of terminal joint more or less suffused with dark fuscous. Antennæ grey ringed with whitish, in ♂ shortly ciliated. Thorax whitish closely irrorated with brownish. Abdomen grey, anal tuft ochreous-whitish. Forewings elongate, costa moderately arched, apex round-pointed, termen very obliquely rounded; pale whitish-ochreous closely irrorated with brownish; stigmata rather large, black, plical smaller, slightly beyond first discal; a spot of blackish suffusion on dorsum slightly before second discal; row of cloudy blackish dots or groups of scales close before margin round termen and posterior part of costa: cilia whitish-ochreous sprinkled with brownish, on costa slightly ferruginous-tinged. Hindwings grey; cilia pale greyish.

Maskeliya, Ceylon (Pole, Alston); in February, May, July and from October to December, twelve specimens.

Strobisia, Clem.

Head smooth-scaled, glossy; ocelli present; tongue developed. Antennæ $\frac{1}{6}$, in ♂ simple, basal joint moderately elongate, without pecten. Labial palpi very long, recurved, second joint smooth-scaled, terminal joint as long as second, slender, acute. Maxillary palpi very short, filiform, appressed to tongue. Posterior tibiæ with rough scales above. Forewings with 2 and 3 stalked, 7 and 8 stalked, 7 to costa or sometimes apex or rarely absent, 9 seldom out of 7, 11 from middle. Hindwings 1 or over 1,

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elongate-trapezoidal, termen somewhat sinuate, cilia ½-1; 3 and 4 connate or stalked, 5 somewhat approximated, 6 and 7 stalked or approximated towards base.

This genus closely approaches *Brachmia* in structure, differing in the smooth glossy head, the more generally costal termination of vein 7 of forewings, and the presence of metallic markings; the last-mentioned character, though apparently trivial, is constant and easy of appreciation, and the separation is undoubtedly natural, the two genera being not in fact very closely allied. I describe 10 new species, and include also in their places those already known from the Indian region.

Strobisia aurantiaca, Wals.

Kandy, Galle, Colombo, and Yatiyantota, Ceylon; N. Coorg, 3,500 feet.

Strobisia amethystias, Meyr.

Peradeniya, Kandy, Kegalle, and Galle, Ceylon.

Strobisia augusta, n. sp.

♂. 13 mm. Head and thorax dark fuscous, lower part of face whitish-ochreous. (Palpi broken.) Antennæ dark fuscous, beneath whitish-ochreous, spotted on sides. Abdomen dark fuscous, beneath whitish, with lateral series of oblique dark fuscous bars, anal tuft whitish. Forewings elongate, rather narrow, posteriorly slightly dilated, costa almost straight anteriorly, gently arched towards apex, apex obtuse, termen faintly sinuate, little oblique; 7 absent; dark fuscous, anteriorly tinged and somewhat streaked towards base with orange-ochreous; markings pale violet-blue-metallic, dark-edged; costal and median streaks from base to ⅓; an oblique irregular streak from beyond apex of costal streak to disc beyond middle, followed by an oblique fulvous streak from costa; a spot above dorsum before middle; an oblique striga towards dorsum beyond middle; a straight fascia before ¾, interrupted above middle, followed by a transverse somewhat lighter fuscous line; terminal area beyond this tinged with fulvous and obscurely streaked longitudinally with blackish-fuscous, the streaks terminated in irregular pale violet-blue-metallic spots before margin; cilia bluish-leaden-metallic. Hindwings blackish-fuscous, somewhat lighter anteriorly; cilia grey-whitish, basal third blackish.

Khasis; in September, one specimen.

Strobisia uranopis, Meyr.

Koni, Burma.

Strobisia victrix, n. sp.

♂ ♀. 10-12 mm. Head dark fuscous, lower part of face bronzy-whitish. Palpi bronzy, terminal joint whitish with two black lines. Antennæ ochreous-whitish, spotted with dark fuscous. Thorax dark fuscous, with three metallic-blue stripes. Abdomen dark fuscous, beneath ochreous-whitish except towards base of segments. Forewings elongate, rather narrow,

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posteriorly slightly dilated, costa slightly arched, apex obtuse, termen sinuate, little oblique; 7 and 8 long-stalked, 7 to apex; blackish-fuscous; markings violet-blue-metallic; a streak along costa from base to $\frac{1}{3}$, thence continued obliquely downwards to below middle of disc; a subdorsal streak from base to near middle; a spot on dorsum at $\frac{2}{3}$; a somewhat oblique slightly curved irregular fascia from $\frac{2}{3}$ of costa, reaching $\frac{2}{3}$ across wing; an irregular fascia immediately before termen, tending to be broken into three or four spots; termen tinged with fulvous, with a black marginal line: cilia bluish-leaden-metallic. Hindwings dark fuscous; cilia fuscous, with dark fuscous subbasal shade.

N. Coorg, 3,500 feet (Newcome); in May, July and November, five specimens.

Strobisia armata, n. sp.

♂ ♀. 10-11 mm. Head bronzy, lower part of face whitish. Palpi whitish, second joint suffused with dark grey towards apex anteriorly, terminal joint with two blackish lines. Antennæ dark fuscous, beneath whitish. Thorax fulvous, with three leaden-metallic stripes. Abdomen dark leaden-grey, apex whitish, beneath ochreous-whitish except towards base of segments laterally. Forewings elongate, slightly dilated posteriorly, costa slightly arched, apex obtuse, termen slightly sinuate, little oblique; 7 and 8 long-stalked, 7 to apex; rather bright fulvous; markings bluish-leaden-metallic edged with blackish scales; a streak from base along costa to $\frac{1}{3}$, thence obliquely across wing to $\frac{2}{3}$ of dorsum, where it meets a slightly curved rather narrow fascia from $\frac{3}{5}$ of costa; a subdorsal streak from base to $\frac{2}{5}$; a small white mark on costa beyond postmedian fascia; posterior area beyond this fascia wholly black, except an irregular blue-leaden-metallic fascia close before termen, leaving a fulvous black-edged terminal line: cilia bluish-leaden-metallic. Hindwings blackish-fuscous; cilia dark fuscous.

Khasis; in September, two specimens. I regard the following as probably a seasonal form:—

var. *obscurata*. ♂ ♀. 11-16 mm. Differs from the type in having the fulvous ground-colour duller and more or less largely mixed and suffused with dark fuscous, sometimes mostly obscured, usually forming a more or less defined dark fuscous sometimes pale edged blotch on dorsum about middle; sometimes an obscure pale oblique transverse line from the white costal spot.

Khasis; in November, six specimens.

Strobisia enoptrias, n. sp.

♀. 14-16 mm. Head and thorax dark prismatic-bluish-fuscous. Palpi bronzy-fuscous, anterior edge of terminal joint dark fuscous. Antennæ dark fuscous. Abdomen dark fuscous, beneath whitish except towards

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base of segments on sides. Forewings elongate, rather narrow, hardly dilated, costa slightly arched, faintly sinuate in middle, apex obtuse, termen somewhat rounded, oblique; 6 to apex, 7 and 8 stalked; dark bronzy-fuscous; a very broad leaden-metallic streak along costa from base to $\frac{1}{3}$, and one less broad along dorsum from base to near middle, confluent at base, and with their posterior extremities connected by an angulated bar; a broad slightly curved leaden-metallic fascia from middle of costa to $\frac{2}{3}$ of dorsum; an oblique white strigula on costa at $\frac{2}{3}$; a broad leaden-metallic terminal fascia narrowed to tornus, marked with a whitish-ochreous dash from apex: cilia leaden-metallic, on costa with basal third whitish-ochreous, marked with black at extreme base. Hindwings dark fuscous, more blackish-fuscous posteriorly; cilia dark fuscous.

Khasis; four specimens.

Strobisia brabylitis, n. sp.

♀. 12 mm. Head and thorax dark bronzy-fuscous, lower part of face ochreous-whitish. Palpi pale greyish-ochreous, towards base more whitish-ochreous, anterior edge of terminal joint dark fuscous. Antennæ fuscous ringed with black. Abdomen dark purplish-fuscous, central third of ventral surface whitish-yellowish except on anal segment. Forewings elongate, rather narrow, posteriorly dilated, costa slightly arched, apex obtuse, termen somewhat sinuate, little oblique; 7 and 8 long-stalked, 7 to apex; bronzy-blackish; markings leaden-bluish-metallic; a streak along costa from base to near middle; four rather narrow transverse fasciæ, first at $\frac{1}{3}$, expanded on dorsum as a suffused patch to base, second oblique, from extremity of costal streak to dorsum beyond middle, third from a triangular white spot on costa at $\frac{3}{5}$, slightly curved, confluent with second on dorsum, fourth terminal: cilia dark fuscous. Hindwings blackish-fuscous; cilia dark fuscous, with blackish subbasal shade.

N. Coorg, 3,500 feet (Newcome); in December, one specimen.

Strobisia leucoplecta, n. sp.

♂ ♀. 8-9 mm. Head fuscous, face paler or whitish-fuscous. Palpi fuscous-whitish, second joint more infuscated towards apex, terminal joint with dark fuscous line on each side. Antennæ dark fuscous. Thorax dark leaden-fuscous. Abdomen dark grey, apex whitish. Forewings elongate, rather narrow, somewhat dilated posteriorly, costa slightly arched, apex obtuse, termen slightly sinuate beneath apex, little oblique; 7 and 8 long-stalked, 7 to just above apex; olive-ochreous suffusedly mixed with blackish, towards posterior half of costa and entire terminal area wholly suffused with blackish; markings leaden-metallic edged with black; a broad streak along costa from base to middle, thence continued across wing to $\frac{3}{4}$ of dorsum, connected also at $\frac{1}{4}$ with a blotch on basal portion of dorsum; a rounded-transverse white spot on costa at $\frac{3}{5}$ touching a leaden-

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metallic spot in disc beneath it; an irregular thick transverse streak close before termen, leaving termen olive-ochreous edged with a black marginal line: cilia leaden-metallic. Hindwings rather dark grey; cilia grey.

Puttalam, Trincomali, and Galle, Ceylon (Pole, Fletcher); in June and from October to January, five specimens.

Strobisia immeritella, Walk.

Madulsima, Ceylon.

Strobisia epicentra, n. sp.

♂ ♀. 7-10 mm. Head and thorax bronzy-fuscous. Palpi white, with a black line on each side throughout. Antennæ whitish lined with blackish. Abdomen grey, apex ochreous-whitish. Forewings elongate, rather narrow, costa slightly arched, faintly sinuate in middle, apex obtuse, termen somewhat sinuate beneath apex, little oblique; 7 to costa, 8 and 9 out of 7; blackish-fuscous; a fine white line immediately beneath costal edge from base almost to middle; an irregular yellow-ochreous patch on basal portion of dorsum, sending a very oblique streak to extremity of this line, receiving a yellow-ochreous line from base above middle, and continued to upper extremity of a strongly inwards-oblique very elongate-oval yellow-ochreous ring in disc beyond middle, this latter portion edged beneath by a white streak; two oblique slightly curved yellow-ochreous streaks from dorsum before middle to lower margin of this white streak, united at tips by a bar, second followed by more or less white suffusion; a yellow-ochreous streak from a white mark on costa at $\frac{3}{4}$ to dorsum before tornus, obtusely angulated in disc, separated on upper half from preceding markings by a white streak, and on lower portion by more or less white suffusion, and followed by a slightly curved leaden-metallic streak running from three short whitish strigulæ on costa to tornus; terminal space beyond this yellow-ochreous, cut by three black bars, of which the median is thickest, upper linear: cilia pale ochreous, on upper part of termen leaden-metallic, on costa dark fuscous with whitish base, somewhat prominent at apex. Hindwings grey or dark grey; cilia ochreous-whitish more or less tinged with grey, becoming greyer round apex.

Maskeliya, Ceylon (Pole); in January, February, May, June, and October, eight specimens. This species, with the preceding and three following, forms a group requiring close attention as their markings are complex and superficially very similar; they can however easily be recognised if note is taken of the neuration, the markings of the palpi, and the character of the black marks preceding and following the subterminal metallic streak.

Strobisia rhabducha, n. sp.

♂ ♀. 11-12 mm. Head bronzy-fuscous, face paler or whitish-bronzy. Palpi fuscous-whitish, second joint dark fuscous towards apex anteriorly, terminal joint with a black line on each side. Antennæ dark fuscous,

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extreme apex whitish. Thorax dark bronzy-fuscous. Abdomen grey, apex whitish. Forewings elongate, rather narrow, costa slightly arched, apex obtuse, termen sinuate beneath apex, somewhat oblique; 7 absent, 8 and 9 stalked; blackish-fuscous; a pale grey supramedian streak from base to beyond middle, surmounted by an ochreous-yellow streak, both terminated by upper portion of a strongly inwards-oblique elongate-oval ochreous-yellow ring; two oblique white streaks from costa anteriorly running into subcostal yellow streak; an ochreous-yellow dash beneath supramedian streak near base; an irregular oblique-transverse blotch of ground-colour margined with ochreous-yellow extending from dorsum to supramedian streak before middle of wing; dorsal area before and beyond this somewhat mixed with whitish, area between oblique discal ring and tornus suffused with white mixed with grey; a pale leaden-grey oblique streak from near costa in middle to disc at $\frac{2}{3}$ more or less edged on both sides with ochreous-yellow, and shorter white oblique streak from costa adjacent to this posteriorly; three short white strigulæ on costa posteriorly, from third a straight leaden-metallic streak runs to tornus, preceded on lower $\frac{2}{3}$ by four anteriorly confluent ochreous-yellowish longitudinal marks appearing to enclose three wedgeshaped marks of ground-colour, and margined posteriorly by an ochreous-yellow terminal streak enclosing a black terminal line thickened beneath apex: cilia fuscous, outer half becoming whitish-ochreous towards tornus, on upper part of termen shining leaden-grey, on costa dark fuscous with base whitish, forming a somewhat prominent apical hook. Hindwings grey; cilia pale grey.

Maskeliya, Ceylon (Pole); in January, from March to June, and in September and October, twelve specimens. Five examples from N. Coorg, 3,500 feet (Newcome), are smaller, 9-10 mm., more sharply marked, terminal black line of forewings forming a more abrupt subapical spot; three from Nilgiri Hills, 3,500—6,000 feet (Andrewes) are 10-12 mm., subapical spot as well-marked as in these, but hindwings more or less suffused with whitish, especially in the specimen from 6,000 feet; the palpi and neuration are alike in all these, and I consider them all specifically identical.

Strobisia bicunea, n. sp.

♂ ♀. 9-10 mm. Head and thorax dark bronzy-fuscous, face bronzy-whitish. Palpi whitish, terminal joint with a dark fuscous line. Antennæ dark fuscous, extreme apex white. Abdomen grey, in ♂ with segmental margins and anal tuft whitish. Forewings elongate, rather narrow, costa slightly arched, faintly sinuate in middle, apex obtuse, termen sinuate beneath apex, somewhat oblique; 7 to costa, 8 and 9 out of 7; blackish-fuscous; a somewhat arched yellow-ochreous subcostal streak from base to disc beyond middle, edged beneath by a shorter leaden-grey streak not reaching either extremity; two oblique white streaks from costa anteriorly

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running into subcostal streak; an incurved yellow-ochreous line from $\frac{1}{3}$ of dorsum to before apex of leaden-grey streak, and a fine white S-shaped line from beyond middle of dorsum to its apex; an oblique leaden-grey line from middle of costa to beyond apex of subcostal streak, nearly obsolete at origin, continued as a fine white S-shaped line parallel to the preceding one to dorsum, between these parallel lines is a yellow-ochreous dot; an oblique white striga from costa beyond middle, becoming yellow-ochreous beneath, and two short direct white strigulæ from costa posteriorly; a straight leaden-metallic streak from costa beyond these to tornus, margined anteriorly below middle by two wedgeshaped black marks surrounded with yellow-ochreous suffusion, and posteriorly above middle by a small black spot reaching termen, remainder of terminal area yellow-ochreous: cilia pale ochreous, basal third shining leaden-grey, tips dark fuscous on upper part of termen, on costa dark fuscous with base whitish, forming a somewhat prominent apical hook. Hindwings in ♂ grey-whitish or whitish-grey, darker posteriorly, cilia whitish; in ♀ rather dark grey, cilia grey.

Khasis; in April and from July to November, eighteen specimens.

Strobisia gradata, Meyr.

Khasis; Karsiang, 5,000 feet, E. Himalayas.

Strobisia hibisci Stt.

Maskeliya and Puttalam, Ceylon; N. Coorg, 3,500 feet; Pusa, Bengal; Calcutta; Khasis. Larva on *Hibiscus*.

Strobisia lamprostoma, Zell.

Yala, Ceylon (Fletcher); in February. Widely distributed in Africa and S. Europe.

Strobisia balteata, n. sp.

♀. 13-14 mm. Head bronzy-fuscous, face paler, becoming whitish-ochreous beneath. Palpi pale whitish-ochreous, second joint tinged with yellowish, anterior edge of terminal joint dark fuscous. Antennæ dark fuscous. Thorax dark bronzy-fuscous. Abdomen dark fuscous. Forewings elongate, slightly dilated posteriorly, costa slightly arched, more strongly posteriorly, apex obtuse, termen nearly straight, oblique; 7 and 8 stalked, 7 to apex; dark shining purplish-leaden-grey; a blackish-fuscous trapezoidal blotch on dorsum before middle, reaching $\frac{2}{3}$ across wing, edged with whitish-ochreous; an oblique whitish-ochreous strigula from costa before middle, edged posteriorly with dark fuscous; second discal stigma small, transverse-linear, whitish-ochreous; a nearly straight double whitish-ochreous streak from about $\frac{3}{4}$ of costa to dorsum before tornus, somewhat dilated on costa, followed by a fascia of blackish-fuscous suffusion; a whitish-ochreous streak round apex and termen to near tornus, thickened at apex, edged with a blackish marginal line: cilia shining dark leaden-grey. Hindwings blackish-fuscous; cilia dark fuscous.

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Khasis; in October and November, two specimens.

Nosphistica, n. g.

Head smooth; ocelli present; tongue developed. Antennæ $\frac{5}{6}$, in ♂ with long fine ciliations (4), basal joint moderately elongate, without pecten. Labial palpi very long, recurved, second joint smooth-scaled, terminal joint as long as second, slender, acute. Maxillary palpi short, filiform, appressed to tongue. Posterior tibiæ rough-scaled above, basal joint of tarsi tufted at apex. Forewings with 3 and 4 out of 2, 7 absent, 8 and 9 stalked. Hindwings over 1, trapezoidal, termen irregularly sinuate, cilia $\frac{4}{5}$, costa with projecting scale-teeth; 3 and 4 connate, 5 absent, 6 and 7 stalked.

A genus of peculiar facies and uncertain affinity, but probably allied to *Strobisia*; specially characterised by the costal scale-teeth of hindwings.

Nosphistica erratica, n. sp.

♂ ♀. 15-17 mm. Head dark fuscous, face pale whitish-ochreous, collar tinged basally with whitish-ochreous, probably expansible. Palpi pale whitish-ochreous, second joint with submedian and apical blackish bands, anterior edge of terminal joint blackish. Antennæ dark fuscous, towards base ringed with whitish-ochreous, apex and a band towards apex whitish. Thorax dark fuscous, in ♀ with posterior extremity mixed with pale ochreous. Abdomen dark fuscous, segmental margins more or less marked with pale ochreous-yellowish, segment 4 with pale ochreous-yellowish spot on sides. Posterior legs whitish, banded with blackish. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen nearly straight somewhat oblique; dark purplish-fuscous; a whitish-ochreous strigula on costa near base, and a transverse series of irregular marks about $\frac{1}{4}$; an irregular transverse spot from dorsum about middle, reaching nearly half across wing, in ♂ whitish, in ♀ yellowish; an obscure darker spot in disc at $\frac{2}{3}$, more or less edged laterally with whitish; a small white triangular spot on costa towards apex, and another at tornus: cilia dark fuscous, white on these spots. Hindwings with projecting blackish scale-teeth on costa at $\frac{1}{3}$ and $\frac{2}{3}$, termen with an irregular excavation above middle; dark fuscous; a white spot on middle of costa, and another before apex; two rather large blackish spots longitudinally placed in middle of disc, more or less whitish-edged; cilia dark purplish-fuscous, on lower half of termen pale whitish-ochreous with a blackish basal line which is much thickened at tornus with broad scales, dorsum also with rough projecting blackish and whitish scales.

Maskeliya and Kandy, Ceylon (Pole, Green); in March and September, two specimens.

Hyptiastis, n. g.

Head with appressed scales; ocelli present; tongue developed. Antennæ 1, somewhat thickened towards base, in ♂ with short very fine widely

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scattered cilia towards base, basal joint elongate, without pecten. Labia palpi very long, curved, ascending, second joint thickened with appressed scales, terminal joint as long as second, slender, acute. Maxillary palpi very short, filiform, appressed to tongue. Posterior tibiæ densely hairy above. Forewings with 2 and 3 short-stalked, 7 and 8 stalked, 7 to costa. Hindwings over 1, trapezoidal, apex obtuse, termen not sinuate, cilia $\frac{1}{2}$-$\frac{3}{5}$; 3 and 4 stalked, 5 approximated, transverse vein absent between 5 and 6, 6 and 7 stalked.

Probably a development of *Brachmia*, distinguished by the costal termination of vein 7 of forewings; the dilated hindwings of ♂ suggest relationship to *Timyra*.

Hyptiastis clematias, n. sp.

♂ ♀. 17-19 mm. Head and thorax whitish-ochreous, shoulders dark fuscous. Palpi whitish-ochreous, second joint and base of terminal suffused with rather dark fuscous. Antennæ whitish-ochreous, indistinctly ringed with dark fuscous. Abdomen whitish-ochreous. Forewings elongate, rather narrow, costa moderately arched, apex obtuse, termen in ♂ nearly straight, rather oblique, in ♀ slightly rounded and more oblique; dark purplish-fuscous; a whitish-ochreous dorsal stripe from base to tornus, in middle with a broad-triangular prominence reaching half across wing, before tornus with another triangular projection which is more or less, suffused posteriorly: cilia whitish-ochreous, on costa dark purplish-fuscous. Hindwings in ♂ considerably broader and more oblong than in ♀, whitish-ochreous, deeper-tinged and with somewhat modified scales towards base, veins 6 and 7 and a streak along posterior $\frac{2}{3}$ of costa and apical portion of termen suffusedly dark fuscous; in ♀ light grey, dorsum suffused with whitish-ochreous, dark markings indicated as in ♂ but indistinct; cilia whitish-ochreous, on costa dark fuscous.

Nilgiris, 6,000 feet; in May (Andrewes), three specimens.

XYLORYCTIDÆ.

Paradoris, Meyr.

Head with loosely appressed scales, side-tufts roughly spreading; ocelli present; tongue developed. Antennæ $\frac{3}{4}$, in ♂ simple, basal joint moderately elongate, without pecten. Labial palpi long, recurved, second joint much thickened with dense scales, sometimes somewhat projecting at apex beneath, terminal joint as long as second, slender, acute. Maxillary palpi very short, filiform, appressed to tongue. Posterior tibiæ clothed with long rough hairs above. Forewings with 2 from towards angle, 3 from angle, 7 and 8 stalked, 7 to apex or termen, 11 from middle. Hindwings 1, elongate-ovate, more or less pointed, cilia 1-1$\frac{1}{4}$; 3 and 4 connate, 5 parallel, 6 and 7 long-stalked.

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Type *P. anaphracta*, Meyr. Although indicated, this genus has not been fully characterised before.

Paradoris amphicalyx, n. sp.

♂ ♀. 11-13 mm. Head white, lower part of face fuscous. Palpi white, second joint dark fuscous, except apex. Antennæ blackish. Thorax white, posterior extremity blackish. Abdomen whitish-ochreous suffused with pale grey. Forewings elongate, costa moderately arched, apex round-pointed, termen very obliquely rounded; ochreous-white; a moderate blackish basal fascia, posterior edge nearly straight; plical and first discal stigmata minute, black, plical beneath first discal; a moderate blackish fascia about $\frac{3}{5}$, constricted in middle; several undefined dots or groups of blackish scales round apical part of costa and upper part of termen: cilia ochreous-whitish. Hindwings grey; cilia ochreous-whitish.

Cuddapah, 4,000 feet (Campbell); four specimens.

Paradoris rhodota, n. sp.

♂ ♀. 12-14 mm. Head and thorax dark fuscous, face paler. Palpi whitish mixed with blackish, second joint blackish except apex. Antennæ blackish. Abdomen light grey, apex ochreous. Forewings elongate, costa moderately arched, apex obtuse, termen very obliquely rounded; light rosy-pink; a narrow blackish basal fascia; plical and first discal stigmata minute, black, first discal sometimes placed in a small yellowish spot, plical beneath it; second discal represented by a black transverse mark, sometimes surrounded with yellowish, resting on apex of a transverse blackish dorsal spot; a small blackish spot on costa slightly beyond this; a row of small black dots round apex and termen: cilia light grey, towards base light rosy-pink, with some blackish points. Hindwings grey; cilia pale greyish.

Cuddapah, 4,000 feet (Campbell); five specimens.

Paradoris stesichora, n. sp.

♂ ♀. 11-13 mm. Head and thorax whitish-ochreous tinged with pink. Palpi brownish-ochreous irrorated with dark fuscous, terminal joint and apex of second whitish. Antennæ fuscous. Abdomen pale ochreous tinged with grey. Forewings elongate, costa moderately arched, apex round-pointed, termen very obliquely rounded; whitish-ochreous tinged with rosy-pink, with some scattered fuscous and dark fuscous scales; a small blackish spot on base of costa, and one on dorsum near base; stigmata blackish, first discal forming a small round spot, plical dot-like, beneath it, second discal absorbed in a transverse blotch from dorsum; a small blackish spot on costa slightly beyond this, in one specimen little marked; some cloudy undefined blackish dots round apex and upper part of termen: cilia whitish-ochreous, towards base slightly pinkish-tinged and somewhat sprinkled with fuscous and dark fuscous. Hindwings grey; cilia whitish-ochreous.

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Palni Hills (Campbell); Nilgiris, 3,500 feet, in March (Andrewes); two specimens.

Paradoris palacta, n. sp.

♀. 13 mm. Head white, lower part of face dark fuscous. Palpi white, second joint dark fuscous except apex, scales rather projecting at apex beneath. Antennæ dark fuscous. Thorax whitish-ochreous sprinkled with dark fuscous. Abdomen grey. Forewings elongate, costa moderately arched, apex round-pointed, termen very obliquely rounded; whitish-ochreous irregularly sprinkled with dark brown; an elongate black mark along base of costa; a transverse blackish spot from dorsum near base; first discal stigma dot-like, black, second represented by a roundish black spot resting on a transverse-oblong blackish dorsal blotch; a moderate semi-circular blackish spot on costa rather beyond this; a row of cloudy blackish dots round apical portion of costa and termen: cilia ochreous-whitish, sprinkled with dark brown and blackish towards base. Hindwings grey; cilia pale whitish-ochreous tinged with grey.

N. Coorg, 3,500 feet (Newcome); one specimen.

Paradoris acatharta, n. sp.

♂ ♀. 13-14 mm. Head pale yellowish somewhat sprinkled with dark fuscous, in one specimen centrally suffused with blackish. Palpi whitish-yellowish, second joint more or less suffused with blackish irroration except apex, terminal joint somewhat sprinkled with black. Antennæ fuscous, obscurely pale-ringed towards base. Thorax pale purplish-grey spotted with pale yellowish, and suffusedly irrorated with black. Abdomen in ♂ whitish-ochreous-grey, anal tuft whitish-ochreous, in ♀ grey. Forewings elongate, costa moderately arched, apex round-pointed, termen extremely obliquely rounded; whitish-ochreous, irregularly marbled with light purplish-grey suffusion irrorated with black; the dark colouring forms a basal patch containing two short ochreous-yellow streaks from base and limited by a pale yellowish-tinged line from before $\frac{1}{3}$ of costa to $\frac{2}{5}$ of dorsum, somewhat angulated and tending to be interrupted on fold; it also covers dorsal $\frac{3}{5}$ of rest of wing, including two or three small yellowish spots beyond middle, and extending as a fascia to costa at $\frac{3}{4}$, and along termen to apex; a small dark spot on costa before apex: cilia pale whitish-ochreous sprinkled with black. Hindwings grey; cilia whitish-ochreous.

N. Coorg, 3,500 feet (Newcome); three specimens.

(*To be continued.*)

ERRATUM.

Page 439, line 2, for *hotlias* read *tholias*.

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THE KATHIAWAR LION.

BY

LT.-COL. L. L. FENTON.

(With an Illustration.)

In an article recently contributed by me to our Journal, on the Kathiawar Lion, I did not give any of my own experiences in hunting it. As these tend in some measure to give an insight into the nature of the animal, I send the following account taken from my *shikar* diary in case it may be acceptable for publication.

It is many years now since I shot my first lion, *viz.*, in 1886, when I first went to Kathiawar. The Gir was then at its best in the matter of games of all kinds, and a *terra incognita* to all except a few local European and Junagadh State officials. Having obtained the readily granted permission of the Darbar to shoot a lion, I moved my camp towards the middle of the hot weather to the Talala *Ness* or hamlet, which besides being close to the lion country, has a good pitching ground under a magnificent grove of banyan trees which afford perfect protection from the sun during the day time. It lies about 14 miles, as the crow flies, north of Verawal, from which it can be reached by a so-called made-road which, at the time I write of, was never kept in repairs. Mukhbul Mia, one of the Junagadh Sardars, and the then Superintendent of the Gir, accompanied my camp for the purpose of rendering me all the assistance I required in attaining my object. The best of the State *pagis* or trackers were also placed at my disposal. The latter had already been sent out to mark down the lions some days previous to my arrival.

A few days before, lions had been heard close to Talala, but they had moved away. On the day following my arrival, I heard that there had been a "kill" at Borwao—a *Ness* about 8 miles distant from Talala, and that the *pagis* were tracking up the lion or lions which were responsible for it. I may here mention that the Gir lion rarely if ever returns to its "kill," which is probably owing to its food being so plentiful. The following day the expected *khubber* did not arrive, but on the 14th May—the next day—the *pagis* sent in word to say that there had been a fresh kill near

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Borwao, and the lions, two in number, had been marked down in an adjoining jungle, about 10 miles away from my camp. The *khubber* reached us at about 11 A.M., and a few minutes later Mukhbul Mia and I and as many of our men as we could mount, were on our way to Borwao. After a scorchingly hot ride, we reached our destination, which was the well at Borwao, in about an hour, to find the beaters and *pagis* quite ready for an immediate start. Leaving our horses at the well, and delaying them only long enough to make the final arrangements for the drive, we all started together. After accompanying the beaters for about a mile, Mukhbul Mia and I left them to take up our position for the drive, leaving Hebat, the head *pagi*, to look after the beaters. I had been accustomed to use a bamboo ladder with broad rungs for sitting upon, when, tiger shooting in North Kanara, and had brought one with me on this occasion, but owing to the trees being small and stunted, it could not be used, and we had to be content with sitting on the sloping trunk of a tree with our feet resting on the ground. We had not very long to wait before the drive commenced. The lions were lying under a *wadh* or banyan tree, about two hundred yards distant from our tree. The beaters know beforehand exactly where the lion is lying and keeping fairly close together do not utter a sound, as a rule, until they are pretty close to its lair, when they shout for all they are worth. On the present occasion, almost immediately after the first shout, the lions made their appearance going through the jungle one behind the other at full tilt. I let them each have the contents of one barrel at about 80 yards distance, before they were out of sight. Neither of them gave tongue or seemed to flinch at my shots, and I made sure I had scored a miss; but almost immediately afterwards Gunoo, an old Mahratta retainer of mine, who happened to be seated in the direct line of flight of the lions and only just managed to escape being knocked over by them, by hastily clambering up into a tree, shouted out that the leading lion was wounded with a large patch of blood on its side. I was using an 8-bore smooth bore with a spherical ball. On hurrying down to him we found plenty of blood on the tracks. After waiting half an hour we commenced following up, and very soon

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came upon the lion lying dead, which was a relief as I had some difficulty in keeping the men quiet, and the Darbari sepoys who would keep their muskets on full cock, were just as much a source of danger as the wounded lion! My 8-bore bullet had gone clean through the lion, touching up its heart and lungs, in spite of which it had managed to cover over 150 yards before falling. It measured 9 feet 1 inch in length, carried a short mane and was very fat. It was no good going after the second lion, as when once disturbed, lions clear out of the neighbourhood. Hebat, the *pagi*, informed me that when the beaters got up to the lions under the *wadh* tree, one of the latter was lying down, while the other one was walking backwards and forwards. Owing to the shade they afford, lions are very partial to these trees in the hot weather. I omitted to mention that the "kill" was a buffalo. On my way back to camp, I met the owner of the buffalo who informed me that it had been done to death by three lions, but one of them had been seen breaking away in the early morning.

A few days later, I moved my camp to Sasan, about 12 miles north of Talala, and the headquarters of the Gir Officials, whose offices are contained, for the sake of safety, in a kind of miniature fort on a commanding position. There is no village to speak of, only a few woodcutters' and Rabaris' huts erected just outside the fort walls.

My *pagis* were out everyday, but up to the 29th May had not succeeded in locating any more lions. In the meantime I had varied luck with smaller game, such as sambur and spotted deer locally known by the name of *Pasu*. The season was advancing; there had been some heavy rain, which was followed, as usual, by a good deal of fever amongst my followers. Moreover, with fresh water in all the *nalas*, the lions moved about more than they would otherwise have done, and were in consequence difficult to mark down; so giving up all hope of another lion during this season, I issued instructions for an early move out of the Gir, when luck befriended me again on the following day—the 30th May. I had arranged to stalk sambur and spotted deer in the Khokra jungles between four and five miles due east of Sasan, and to finish up with a drive for anything that would turn up in the middle of

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the day, and had made an early start with Hebat, the *pagi*, and a few coolies. After half an hour's ride along the Khokra track, I sent my horse and tiffin cooly on to Khokra or where Khokra once stood, for it is only a deserted site now, to await my arrival there, while Hebat, I and the rest of the coolies entered the jungle for our stalk. It is unnecessary to enter into any details of this, it is sufficient to say that, although I saw a good deal of game, it was difficult to get a shot, owing to the dead leaves and the dryness of the jungle, and I only bagged a stag chital, when I happened to chance upon a large patch of burnt jungle. By the time I had done this, the sun was well up in the sky, so we turned our faces in the direction of Khokra and commenced walking at our usual place without attemping to preserve silence. After we had been going for about half an hour, Hebat, who was leading in his capacity of guide, suddenly stopped and drew my attention to a crow, which seated on the topmost bough of a tree near the summit of a low wooded hill, which we happened to be passing at the time, was cawing in the way in which crows always caw when something out of the common has attracted their attention.—" Perhaps a lion, saheb " remarked Hebat—and he was right, for the words were hardly out of his mouth before a fine lion sprang out of the jungle, on to a large rock below the tree, and then as suddenly disappeared with a bound into the jungle beyond, and was almost immediately followed by two others. We at once held a council of war as to how we could best circumvent them. As it was almost midday, it was unlikely that the lions, whch had not seen us, would travel very far, especially as it was more than probable they had been feeding off a recent " kill." To send for the coolies, which we were expecting to find collected for the " drive " at Khokra, would have been waste of time, so we decided to track them down with the few men that were with us; and as my breakfast and the men's food was away at Khokra, we lost no time in making a start. The tracking turned out to be a longer job than I had anticipated owing to the ground being baked quite hard.

There was nothing whatever to guide the men except the slight disturbance made by the lion's feet amongst the dead leaves which

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was quite unnoticeable to ordinary eyes. It was wonderful how the men were able to make any progress at all, but they did do so slowly but surely; only one little bit of excitement did we have when Hebat coming to a sudden halt pointed towards a large clump of bamboos and whispered the word "*Sávaz*" (lion) into my ears! With some difficulty I made out what had attracted his attention, but this after all turned out to be a doe chital. After keeping up the tracking for a good two hours without success, we got into more open country. Down in a valley below us, we could see a large banyan tree towering above its neighbours, and Hebat at once declared that, if the lions were in the neighbourhood, we should find them under that tree. To save time, he, I and Kutchra made a bee line for it, leaving the others to follow up the tracks. The lions were there sure enough! As we cautiously approached the tree, Hebat's keen eyes spotted them lying in some coarse long grass at the foot of it, and of almost the same colour as themselves. We could just make out the form of one of them, but the others were certain to be somewhere near. The intervening ground was quite open and devoid of jungle, but about 50 yards on our side of the banyan, stood a small mimosa bush. Keeping this between us and the lions Hebat and I managed to crawl up to it without attracting their attention, although the one we could see was apparently quite wide-awake When, after a rest of a few seconds to steady myself, I rose to my feet to fire, it struck me that the animal we were stalking looked very much like a lioness. I could not make out a mane, whereas the lion we had seen on the top of the hill had an uncommonly good one. Hebat, however, insisted I was mistaken, and as it was difficult to make out much in the glare and the grass, I gave way to his greater experience and fired with the 8-bore. She rolled over with the shot; there was no doubt about her sex now, I was right after all, but she recovered herself immediately and was off. With the left barrel I rolled her over again, but she got to her feet once more, and was out of sight before I could get in another shot. Then, I heard several shots accompanied by excited shouts in the direction she had gone. Thinking some one was being mauled, I re-loaded the 8-bore as I ran along and exchanging it for the 500

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express as being the lighter weapon, soon found myself in the middle of all the excitement. I had only time, however, to see the lioness growling ominously at the foot of a tree, and on the point of charging a *passaeta* or village policeman, who was doing his best to fire off a rusty old matchlock at her. I ran up, he stepped aside, and taking his place, I fired at her chest; but I was the reverse of steady from running and my ball, as I afterwards ascertained, only struck her in the muscles of her shoulder. She did not wait for more, but charged at once with the usual short angry cough—they cannot be called roars. I kept her covered with my rifle as she came on and gave her the contents of the left barrel when she was about twenty paces off. I aimed at her head and by a fluke the bullet went true and effectually doubled her up. However I did not realize this at the moment, for immediately after firing I turned round for my other gun, when to my horror, I saw my man Kutchra running away with it. It is needless to add that I flew after him expecting at every moment to be pulled down by the enraged lioness. It was a welcome shout, indeed, from one of the men which stopped me "*Margaya Saheb, Margaya!*"

She was a full-grown lioness, but not an old one, judging from the spots on her flanks. My first two shots from the 8-bore had both taken effect too high up and had touched no vital part. The men who had fired the shots I had heard, turned out to be a party of my own sepoys who were looking for me and by the merest chance had turned up just in the nick of time. They explained that the lioness nearly ran into them almost immediately after they had heard my shots, they had fired in self-defence and one of their shots had hit her in the body and made her come to a standstill.

In the excitement of the moment I had not noticed what became of the other two lions, but Hebat said he saw them making off in another direction as soon as I had fired. Having had nothing to eat since the early morning, we were about famished by this time, and our water had given out long before, so slinging the lioness on to a pole we made our way back to Khokra where the men's food as well as my own, had been left. On arrival there we found near the spot, where our men were waiting for us,

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the remains of a buffalo, the lions' "kill" in fact. It had, evidently, only been killed on that very morning which would account for the lions being on the move so late in the day, long past their usual hour.

I believe it is a general idea that, *as a rule*, tigers avoid attacking a full grown buffalo. My experience of tigers is somewhat limited; but I can safely state, as regards the lion, that it has no hesitation in attacking a buffalo, when it comes in its way. I was once shown a huge buffalo, which had been attacked by a solitary lion, and which according to the owner, a *Rabari*, had sprung upon it from behind. The buffalo had succeeded in shaking it off, but the poor beast was dreadfully clawed and slowly dying when I saw it. On another occasion I came upon a *Rabari* lamenting over one of several buffaloes he was grazing at the time. He explained that not half an hour before my arrival a lion, whose tracks I had noticed on the road as I came along, had, in spite of his having tried to drive it away by shouting, wantonly attacked this particular buffalo and torn away its udder. It had made no attempt to kill the beast in the usual way, and had bolted without doing any further damage, but the buffalo, a full grown animal, was done for.

To continue, I very nearly succeeded in shooting another lion in these same Khokra jungles a short time afterwards. I came upon it, by the merest chance one morning when out-stalking with one of the Gir *pagis*. We were first made aware of its presence by its suddenly starting to roar, not one hundred yards away from us. Thinking, quite wrongly as it turned out, that it was roaring over a "kill," I tried to stalk it, the *pagi* following me; but we had not advanced very far before the latter touched my arm and pointed in the direction of a thick clump of bushes not twenty yards away. It was all very fine of him to whisper "*Maro, Sahib!*" I could see nothing until there was a rustle, and the lion was off without giving me a shot. I ran after it, but the chance was gone, and I never saw it again. There was no "kill." It was probably calling to its mate, but its roar had the effect of attracting all the animals in the jungle to the spot, for spotted deer and sambur were calling in every direction!

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On another occasion, I chanced upon two lions in much the same way. On this occasion, my attention was attracted by the belling of a sambur. Thinking that it must have seen a panther, I was peering about the jungle, looking for the latter, when up got a couple of young lions from under a large corunda bush, and trotted away quite unconcernedly, stopping every now and again to have a look at the intruders. It was with difficulty that I resisted the temptation of shooting one or both, but I had shot my share of lions for the season and besides these animals were hardly more than half grown.

During the year 1890, H. R. H. the late Duke of Clarence, paid the Gir a short visit, at the invitation of H. H. the Nawab of Junagadh, for the express purpose of shooting a lion. Everything that was possible to ensure success was done by the Nawab, but in the end the Prince had to leave without a lion having been bagged either by him or one of his party. It was almost a case of too much *bandobast*.

The shooting camp was pitched, as usual, at Sasan. A party of three lions had been tempted by nightly feeds of buffalo, to remain in the neighbourhood, and on the morning succeeding the Prince's arrival, they had been safely marked down in a good position for "driving." The tree on which His Royal Highness was stationed had been selected after much deliberation ; and, if all had gone well, the lion should have passed, within a few feet of it. Of course, the unexpected happened! Far too many beaters had been provided by the Darbar. The men responsible for the "drive" were unable to control them properly, with the consequence that they commenced to shout at the wrong end of the line and far too soon. The result was what would be expected under the circumstances: the lions, on being disturbed, bolted in the wrong direction, nowhere near the Prince's tree. They passed, it is true, close to the tree occupied by one of the officers of his staff, but he failed to bag one, and the gun in the next tree also failed in a long shot. The lions cleared out of the neighbourhood and unfortunately no others were marked down before the Prince's visit came to a termination and every one except myself left the Gir.

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Some days later, *khubber* was brought in to me late one afternoon that a lion had been marked down about 4 miles away from camp. It was almost too late to make any use of it, especially as I heard at the same time that only some half a dozen beaters could be got together at that hour, but it was worth the attempt. I started at once, and taking my rifle with me galloped to the spot, where my man was waiting for me, arriving just as it was beginning to get dark. After all there were only two or three men to do the driving. The lion was lying, as usual, at the foot of a large banyan tree and would soon be on the move—there was no time to be lost. I scrambled into the first tree which was at all suitable, and my man Oomar went off to assist in the driving. All might have turned out well, but almost as soon as Oomar had gone, I realized I should have the greatest difficulty in firing out of my tree without being knocked out of it. There was not a single branch to hang on to, and it was impossible to get down the smooth trunk with my rifle. I had to make the best of a bad job. I had not long to wait. A couple of shouts, and the lion was in evidence in the now fast increasing dusk.

It looked a magnificent beast in the uncertain light. If only I could get in a straight shot! But it was not to be. The lion started by making directly for my trees, but had not gone far before it turned off to the light and made up a hill. I balanced myself with much difficulty as I got in two snapshots before it disappeared over the brow of the hills. The result, as might have been expected, was nil. How I regretted I had not stood at the foot of the tree, or at any rate, tried to stalk it, but one always knows what one *ought* to have done after it is all over!

On the 1st May of the same year, I moved my camp to Moduka, a more pretentious *Ness* than the generality of them, in the very heart of the lion country. As I was leaving Sasan, I heard a lion roaring in the distance which I hoped portended good luck! My men had some difficulty in finding a suitable tree for my camp, owing to the best site being so overgrown with jungle, and when I arrived I found I had to share my camp with the grave of a Mahomedan Pir, which almost blocked up one of the entrances to my tent. An ancient worn-out black goat, which some days

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before had been dedicated as an offering to the departed, by some devotee, was quietly grazing outside, and soon became very tame. A few days afterwards it was carried away in broad day-light by a Panther. I was busily engaged at the time inside the tent, when I heard a suppressed gurgle from the goat just outside, but thought nothing of it until a short time afterwards, the servant came running in to say what had happened. True enough the handful of black hair and the patches of blood told their own tale—the goat had gone—bodily carried away. I followed up the track until we lost them on the hard ground, my best *pagis* being away at the time. I sat up for the panther with a live goat in the evening, but although I heard it calling, it never came near me and I never heard of it again in the neighbourhood.

On the 8th May the *pagis* sent in *khubber* to say that they had found a lion. They had been looking for them ever since my arrival at Moduka. At the same time *khubber* was also sent to a brother officer and his friends who were then occupying my old camp at Tálálá. We all met at Khokra, where again the lion or lions had been marked down. It was not certain how many there were, but only one had been actually seen. The *pagis* advised a drive, but after past experiences we decided in the end to walk it up. One of us, if not all, was bound to get a shot in this way, whereas it was impossible to say what would be the result of a drive. The lion had been last seen on the brow of a low hill covered with small jungle, lying down in the shade of a small tree. My friends had quite an army of *darbarsi* sepoys, with them, all armed with antiquated muskets, besides the usual paraphernalia of swords, knives, daggers, etc. It certainly would have been *safer* to have left them all behind, but we did not wish to hurt their feelings; they were all so eager to come with us, so we allowed them to follow close behind us, on the express understanding that they were only to fire in the event of being charged, not otherwise. All being ready, we commenced our stalk, under the guidance of the *pagi* who had last seen the lion. We reached the top of the hill in dead silence, expecting to see the lion at any moment. It was disappointing, therefore, to find it had moved. However, while

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peering about, I caught sight of it lying down under another tree, and after signalling to the others to be on the lookout I fired from a sitting position, the only one in which I could see the lion from where I happened to be. This was the signal for everyone, including the sepoys to empty their rifles! How any one escaped being hit was a wonder. The lion, in the meantime, was bolting away, though not at any great pace, as my first shot had struck it in the body, my second went anywhere, but I managed to get in a third shot with the 8-bore which my man thrust into my hands just in time, and this was followed by the welcome thud and the appearance of a red patch on the lion's side. With the left barrel, fired as it was disappearing, I missed. While we were all reloading, a second lion, which must have been lying somewhere near, suddenly appeared and stood growling at us for a few seconds but followed in the wake of its companion before anyone was ready to fire. All this took place within the space of a few seconds. The wounded lion with an 8-bore bullet through its body was unlikely to go very far. We gave it about twenty minutes law and then commenced to follow up, taking care not to run any further risks from the sepoys by leaving them behind. The *pagis* did the tracking, while we three kept a sharp lookout ahead. We very soon came up on the lion. It was lying on the ground. I got in the first shot, when it went off again without attempting to charge; but only to fall again a few yards further on, where another shot killed it outright. "What a cur" was the first remark, made by one of my companions, when it was all over, and he was right. Temperaments vary amongst all animals as much as they do amongst human beings. It was a fine lion with a good mane.

I got *khubber* of two more lions on the next day, but they had moved before I reached the jungle in which they had been marked down.

A few mornings later, I found the tracks of a lion just outside my tent. It had sauntered up during the night to within fifty yards of it, with no evil intentions I am sure, and then turned abruptly off into the jungles. We tried but did not succeed

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in finding it. On the 13th May, I again got *khubber* of a lion which had been tracked into a *bhoira* or water-hole in the Jawantri jungles, about 5 miles away. I arrived at the spot long before sunset, intending to watch over the mouth of it, as the lion was certain to come out in the evening; but as I had promised my Tálálá friend to await his arrival before commencing my watch, I hung about the place—the very soul of impatience (!)—until it was reported to me that the lion had gone. My friend never turned up at all. Never again, I made up my mind, would I wait for anyone, under similar circumstances! On the following day, again, *khubber* came that four lions had been tracked into another *bhoira* near the first one. This *bhoira* had two entrances, about fifty or sixty yards apart from each other. I rode out and took up my position in a tree over one of them, while my friend, who turned up on this occasion, guarded the other entrance when he arrived. Yesterday's lion had emerged from its *bhoira* in broad daylight, but it was nearly dark before I heard a shot from my friend, with what result I did not learn until later. I waited on patiently at my post until it was too dark to see anything, much less the sight of my rifle. When matters had reached this stage, I heard a yawn below me followed by the rustling of dead leaves; the lions were out and apparently lying about at the mouth of the *bhoira* with no intention of moving away at once; but of course, it was impossible to see anything, although they were so close to me. This went on for some time, and as the lions gave no signs of moving and nothing was to be gained by remaining any longer up in my perch, I precipitated matters by firing off my rifle in the direction in which I heard the most rustling, with no results of course, beyond driving the lions away. As soon as all was quiet again, I descended from my tree; my friend it seemed had fired at a single lion. It was found dead on the following morning and turned out to be a half-grown cub.

Bad luck on the whole so far, but I had not long to wait for better! Only two days in fact, when my men sent in word to say that they had found the remains of a freshly killed buffalo, and were following up the lion which had killed it, and would let

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me know by a *sowar* as soon as they had found it. I did not hear from them again on that day, but on the following a *sowar* came galloping into camp bringing the welcome news that the lion had been marked down and the *pagis* were keeping a watch over it from a distance. It was a long ride to the spot, but I reached it at the very best time, *viz.*, at the hottest part of a very hot day. The lion on this occasion had been tracked down by a fine young Sidi from the Jambûda *Ness* who generally worked under the directions of the head *pagi* Hebat whom I have already mentioned. With him was one Ismail, a Mekrani Jemedar in the Jûnágadh State service, also a good staunch man for a tight corner. The lion had not moved and was lying down under a shady tree on the tip top of a small conical hill where the cool breeze direct from the sea could reach it. The ground all around was very rough and hilly and a drive with any certainty of getting a shot was out of the question, especially with the very few men we had with us—only about half a dozen—so I decided on a stalk. The hill was covered with small loose stones, so in order to run no risk of disturbing the lion, we divested ourselves of our boots and shoes at the foot of the hill where we left them with the extra men. Ismail, who was armed with a D. B. muzzle-loading rifle, and I, with the 500 Express, led the way closely followed by the *pagi* who acted as guide and Kutchra with my spare gun. It was painful work getting over the rough ground without boots, but fortunately we had not a long climb. When we were about twenty-five yards from the top of the hill, the *pagi* pointed in the direction we were to look for the lion, and I soon made out the contour of the upper part of its body through the bushes—the lower part of it not being visible owing to the slope of the grounds. To fire from where I was standing was to court a failure as no vital part of its body could be seen, and again it seemed hardly possible to advance any more without disturbing the lion. It was an anxious moment and there was no time to be lost, for the lion might discover us at any moment and be off down the opposite side of the hill for ever. By good luck, however, just at my side, there happened to be an old stump of a tree about a yard high and with a flat top. Once on that—and I saw—it would be

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all plain sailing. The only difficulty was how to mount it without making some slight noise and disturbing the lion in its slumbers, but the *pagi* was equal to the occasion. It was all done by signs—he stooped down; I stepped on his back, and as he gradually raised himself, I was able to step off on to the stump without the lion being a bit the wiser! There was no difficulty about a shot now. The lion was lying on its side with its legs towards us. The others were very quickly behind me, and when Ismail nodded to show that he was quite ready I fired, I only just had time to get in a second shot, which I think must have glanced off a bough as I could find no signs of it afterwards on the lion, before the latter was charging down upon us. I could of course do nothing with an emptied rifle in my hands, but fortunately for us, one of Ismail's two shots fired at uncomfortably close quarters, saved the situation! It struck the lion in the back and the latter instead of charging home, swerved, and just missing us, went tearing down the hill. Its race was however run, for as I looked round to watch it, it turned a complete somersault and after rolling over and over again lay perfectly still.

It was dead. My first shot had broken up in its chest, but if it had not been for Ismail's lucky one, some of us would have fared rather badly.

It was an old lion and its total length was 9 feet 5 inches, the length of its tail being 2 feet 11 inches.

A few days afterwards I shot a 7'-4" panther, and then left the Gir, nearly every soul in my camp being down with malarious fever.

Two years later when I was encamped at Háthina Mália, a *Garassia* village on the borders of the Gir country, H. H. the Nawab was kind enough to grant me permission to shoot another lion. I rode the 22 miles to Sásan, on the 1st June, and as I had only a few days at my disposal, I had already sent out the *pagis* to look out for lions. For two days there was not a vestige of *khubber*, but on the third, when I had already mounted my horse for the purpose of returning to Mália, a *sowar* rode in to say that two lions had broken during the night into a *zareba* at the Nandwao *Ness*, about 4 miles distant from Sásan, and done a lot of

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damage amongst the cattle. Countermanding my orders for striking camp, I rode off at once to the *Ness*, taking my guns with me. On arrival there I found that three cows had been killed by the lions, two of them only had been partially devoured, the third being intact; two more had been badly mauled and a sixth was missing. The *pagis* were already on the tracks and I soon caught them up and kept with them for several hours. We made but slow progress over the hard ground and I was not sorry when they suggested that I should halt for a rest whilst they went on with their work, as I could catch them up again later on when they would call me. I had waited quite two hours and was beginning to think that after all the lions had eluded us, when the messenger came to say that they had been tracked down. The lions were as usual resting under a large banyan tree, at the foot of a rocky hill, known as the Kadlidhar. Ismail was not with me on this occasion. The ground was too open, the *pagis* declared to walk up the lions, so on their advice I decided to try a drive. I only had eleven men with me. I took up my position in a low tree overlooking a shallow *nala* leading past it, and coming direct from the banyan tree under which the lions were lying up and which they were likely to follow. The coolies were instructed not to shout until they were close to the lions. All was done as arranged, but the lions, instead of following the *nala* right up to my tree, only did so for a short distance and then turned off, up the hill just opposite me.

I managed, however, to get in two rather long shots at them as they were leisurely trotting away. I missed the leading lion, but dropped the second one. It immediately recovered itself but instead of following its companion, came wheeling round in my direction in a dazed kind of way and I had no difficulty in killing it with another shot.

The missing cow was found quietly grazing in the jungle close to where the lions were lying up. The *pagis* had noticed its tracks when following up the latter.

The lion measured 9 feet and had a medium-sized mane. The one which got away was a much finer beast. This was the last lion I shot, although I have since assisted others to get one. In my

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subsequent excursions into the Gir, I principally devoted myself to shooting panthers. The largest of over forty shot by me in and around the Gir was almost a record. Its total length was 7′-8½″ and its weight 160 lbs.

The two photographs on the accompanying plate are those of a Kathiawar lion in captivity at Junagadh. It shows the name well grown, and we have to thank Mr. C. H. Hill, I.C.S., and Major J. R. Carter for obtaining these interesting photographs.

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NOTES ON SOME BUTTERFLIES FROM THE INDIAN REGION.

By

G. W. V. DeRhé-Philipe, F.E.S.

The following notes are the result of observations made and notes jotted down during the last two years, in the course of which I have done a good deal of personal collecting in the Sikkim and Bhutan Terais, the Khasi and Naga Hills and Assam generally. I have recently had an opportunity of putting these into form and of comparing my specimens with those in the Indian Museum and de Nicéville collections; and have confirmed, as far as possible, the observations I had previously made. The results may be of interest to the entomological members of the Society.

Danais aglea. Cramer.

Danais melanoides. Moore.

These two are usually considered as distinct species, or, at any rate, as well differentiated races; but my experience has been that none of the distinguishing characteristics are constant. I have taken the species in the Western Ghats, Kumaon, the Sikkim and Bhutan Terais, the Naga Hills and the Chittagong Hill Tracts; and have very carefully examined a long series consisting of specimens from each of these localities. Though extremes can be named readily enough, there are numbers of intermediate forms which it would be impossible, were the locality labels removed, to place either as **aglea** or **melanoides.** My own opinion is that all represent one somewhat inconstant species, **aglea.**

Another characteristic, which has been used to separate **aglea** and its allies from the rest of the genus—the anastomosis of vein 11 with vein 12—is also not constant. The extent of anastomosis varies very considerably. In some cases, a large proportion of vein 11 is anastomosed; in others, the two veins just touch and separate again: while frequently they only approach each other and do not actually touch. Speaking generally, the anastomosis is greatest in the extreme **aglea** form from Western India; and least, if at all existing, in the **melanoides** form from Assam.

D. agleoides. Felder, from Burma and the Malayan region, has been separated from **aglea** mainly on the absence of anastomosis, which, as has been pointed out, fails as a satisfactory test. I have only a small series of this last form; but it seems to be constant in respect of the great reduction of the hyaline markings on both wings, and is thus a distinct local race.

I have, in my collection, a curiously aberrant male of the **melanoides**

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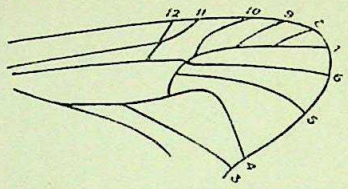
form taken by myself at the foot of the Naga Hills in Assam. The neuration of the forewing in respect of veins 10, 11 and 12 is peculiar as the following sketch will show :—



The hindwing is distinctly rectangular, being bluntly angled at the apex of vein 4. The fuscous border on both wings is broader and almost entirely without the usual hyaline spots, the subterminal row on the forewing being very small and markedly lunular. So different is the facies of the insect that, at first sight, one is inclined to consider it quite a distinct species.

Euplœa core. Cramer.

A female of this species from Khandala in the Western Ghats has the apical white spots of the subterminal series on the forewing greatly enlarged and very prominent. It is practically the variety **vermiculata** described by Butler, but so far only recorded from the submontane tracts of Northern India.

Euplœa diocletiana. Fabricius.

Euplœa ramsayi. Moore.

As far as my experience goes, only one species is to be found in North-East India, and it is impossible to separate the Sikkim insect from that found in various parts of Assam. It is remarkable how very uncommon the females are everywhere. Males are fairly plentiful wherever the species occurs ; but of the dozens of insects I have captured or had brought to me by native collectors, only one has been a female. The same remark applies, in a somewhat lesser degree, to the female of **E. alcathoe,** Godart, a species found fairly commonly in some parts of Assam. Several writers have already remarked on the comparative scarcity of females of many of the species of **Euplœa** ; but the disparity in the numbers of the sexes of these two forms is extraordinarily great.

Euplœa mulciber. Cramer=**E. midamus.** Linnæus. var. nov. duarseri.

This is not a species which varies very much, but a male taken by me in the Duars is so distinct as to merit description. The insect is comparatively small ; and the forewing instead of being marked with the usual numerous violescent spots, is all but immaculate, a tiny dot beyond the cell and a few minute terminal spots being the only *lacunæ* in the intensely rich purple gloss of the wing. On the upperside of the hindwing, the patch of light coloured scales near the base of the cell forming part of the sex

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mark is so reduced as to barely noticeable. There is no similar insect in the series of **E. mulciber** in the Indian museum and de Nicéville collections, but a few specimens in the latter from Borneo, named **E. basilissa,** Cramer, (now sunk as a synonym) approach the Duars insect in the paucity of violescent spots—though even these are far more numerously spotted. In the absence of material showing constancy, my variety can hardly be considered a distinct species; and it is probably a highly melanised example of what is usually a very constant species.

LETHE (Genus). Hübner.

A few remarks with respect to the altitudinal range of the different species of this extensive genus may be interesting. Though the type species—**L. europa,** Fabricius—is a plain's butterfly, the genus is essentially one of the hill country. Only one other species—**L. mekara,** Moore—appears to occur at all generally in the plains. This is in Sylhet where it is rather common in bamboo jungle. It is true that other species such as **L. chandica** and **L. latiaris** have been reported from 'Sylhet,' but it is almost certain that the insects on which these records were based came from the lower Khasi hill country below Cherrapunji, which abuts on the Sylhet plains. This locality is a favorite hunting ground of the native collectors who often speak of it as Sylhet. It is to be noted that **L. europa** and **L. mekara** are the only species of the genus to be found in the plains country of Sumatra (Butt: of Sumatra, de Nicèville, Journ., Asiatic Soc. of Bengal, Vol. LXIV, No. 3, 1895).

Going a little higher in elevation, we come to the next group, one composed of more or less closely connected species. This group includes—

L. bhairava. Moore.
L. latiaris. Hewitson.
L. kansa. Moore.
L. vindhya. Felder.
L. sinorix. Hewitson.
L. chandica. Moore.

and is essentially one of the foot hills. Its range may be said to be between 500 and 3,000 feet. With the single exception of **L. kansa,** none of the species is common anywhere. **L. kansa** is to be found fairly plentifully at low elevations in the Sikkim hills and is very common on the northern edges of the Khasi hills. I have also taken a single specimen at Naini Tal—the only case I know of its occurrence above 2,500 feet, and also, so far, the only record of its existence west of Sikkim.

The rest of the Lethes are, almost without exception, insects of the higher hills. Of these—

L. rohria. Fabricius.
L. nilgiriensi. Guerin.

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L. insana. Kollar.

L. confusa. Aurivillius.

L. verma. Kollar.

L. sidonis. Hewitson.

L. vaivarta. Doherty.

L. nicetas. Hewitson.

L. maitrya. deNicéville.

form one connected group. They range from 3,000 feet to 8,000 feet being best represented between 5,000 feet and 7,000 feet. **L. rohria** and its western form **L. nilgiriensis** and **L. confusa** come down as low as 500 feet, and are, in some localities, common in the foot hills. They form a sort of connecting link with the previous group, and are the only exceptions to the general rule.

Finally, there are the groups separated by Westwood and Butler under the genera **Zophoessa** and **Neope** and including—

L. atkinsonia. Hewitson.

L. jalaurida. de Nicéville.

L. baladeva. Moore.

L. goalpara. Moore.

L. sura. Doubleday.

L. bhadra. Moore.

L. pulaha. Moore.

L. yama. Moore.

Speaking generally, this group belongs to the higher ranges from 5,000 feet to 10,000 feet. I have taken a **pulaha** (local form **pulahoides**) at 3,500 feet in the Naga hills; **goalpara** has been recorded from 'Sibsagar,' but this is a wide term and, from the usual distribution of the species, I am inclined to think the specimen must have come from the higher hill ranges on the borders of the Sibsagar district; **sura** is recorded from a low elevation in Tenasserim and **bhadra** probably goes down to 2,000 feet in the Khasi hill and Burma. The rest appear absolutely limited to altitudes above 5,000 feet.

Aulocera brahminius. Blanchard.

I cannot help thinking that the record of the '**scylla**' variety of this species from Sylhet by Butler is a mistake. Sylhet is a very low-lying district intersected by rivers and dotted with extensive swamps or 'bheels,' absolutely the last place from which one would expect an **Aulocera**, a genus essentially of the higher mountain ranges. If the specimens on which the record is based came from anywhere outside the Himalayas, they must have been from the higher ranges of the Khasi, North Cachar or Naga Hills country on the northern and eastern confines of the Sylhet district.

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Elymnias undularis. Drury.

A male of this species from the Namba forest in Assam is strikingly unlike the normal type and shows to what extremes the species may vary. The subterminal blue markings, so prominent in the type form, are here so reduced as to be hardly noticeable; the usual bright chestnut margin to the hindwing is replaced by a dark brown margin of almost the same tint as in **E. cottonis,** Hewitson from the Andamans; and on the underside the purplish white triangular preapical patch and subterminal fascia and the white spots are all absent. The insect looks entirely different though there is no doubt as to its identity.

Charaxes raidhaka. mihi.

This new species was described by me in the Records of the Indian Museum, Vol. II, Part III, October 1908, page 285 (see also Jour., Bom. Nat. Hist. Soc., Vol. XIX, No. 1, page 270). It subsequently occurred to me that the new form might be a melanised specimen of **C. fabius**; and I have therefore since examined and compared it further with a long series of the latter species. It is always rather dangerous to describe a new species from a single example; but, though I have not obtained any more specimens of **raidhaka,** my further examinations would seem to confirm my separation of it as a new species. The difference in the outline of the wings, noticed in my original description, has held absolutely good in all my later comparisons; and I now add the following further slight differences in markings which I have found very constant in **fabius.**

Upperside.—The deep black colour has, in some lights, a beautiful indigo blue reflection, somewhat similar to that in **E. athamas,** Drury. In **C. fabius** this colouring is sometimes found in *fresh* specimens over a very limited posterior area of the hindwing. *Underside.*—There is at the base of interspace 2 of the forewing a rounded black spot almost filling up the angle between the veins, instead of the very well defined straight transverse line always found in **fabius.** Finally there is in **fabius,** in the precostal cell of the hindwing, a prominent black linear mark, which is entirely absent in the new form.

Eulepis athamas. Drury.

The localisation of the two sub-species **athamas** and **agrarius** as the Northern and Eastern and South Indian forms, respectively, does not always hold good. I have a typical **agrarius** from Dehra Dun at the foot of the Himalayas.

Apatura ambica. Kollar.

There is another species in which the numbers of the sexes taken are very disproportionate. The male is exceedingly common throughout Sikkim and Assam at low elevations near the hills, but I have never yet seen a female there. Curiously enough, the only female I have ever taken was in Mussoorie, where I never saw a male.

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Euripus consimilis. Westwood.

Dimorphic female, form **torsa,** var. nov.

Only one form of the female has hitherto been recorded from India. I now describe a second taken in November 1908 in the Bhutan Duars, which shows that this species, like others of the genus, is also at least dimorphic in the female.

Upperside.—Forewing, deep blue black. A short, outwardly diffuse streak in cell from base and touching the subcostal vein, a large, quadrate, transverse spot near the end of the cell, and a broad preapical band from vein 9 to vein 3, consisting of elongate spots divided by the veins, all white. The cell streak and spot near the end of the cell are thickly powdered with bluish scales. The preapical band is continued into interspaces 2 and 1 by very ill-defined spots. A long streak in interspace 1, a short dorsal streak, and terminal spots in pairs between the veins from tornus to vein 4, obscure white densely covered with dark blue scales. Hindwing, a light creamy white, veins black. Costal area thickly powdered with dark scales, and a subterminal fascia extending from costa to vein 2, very diffuse anteriorly and developing into saggitate spots posteriorly, blue black. Margin as in form already described, but very distinctly defined. *Underside.*—As above, markings more defined. Apical area of forewing and subterminal fascia of hindwing deep brown. The usual crimson patches at base of hindwing.

The form is not represented in the Indian Museum or de Nicèville collections. The insect, on the wing, was an excellent mimic of **Euplœa diocletiana** which is also found in the locality.

Dophla sahadeva. Moore.

Bingham's remark that the antennæ of this species are "dark brown with the apex ochraceous" does not sufficiently describe them and is somewhat misleading. In the male, the inside edge of the anterior third of the antennæ is ochraceous and the tip a bright yellow; in the female, only the tip is yellow. These brightly coloured antennal tips are a very noticeable character of the species.

Dophla patala. Kollar.

The real distribution of this species has long been something of a puzzle to me. Years ago, when I had just started butterfly work, the late Mr. de Nicèville kindly named a small collection for me; and amongst others were two Dophlas which I had taken in Lower Burma, and which he identified as **'Euthalia' patala.** Now **Dophla patala,** according to both Mr. de Nicèville and Col. Bingham, is confined to the Western Himalayas; while the latter ascribes **D. taoona** to the hill ranges of Lower Burma. I have since taken and closely examined a long series of the true **patala** from Mussoorie and Naini Tal, and have endeavoured to work out the differences

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between typical **patala** and **taoona** as noted by those authors. All have failed at some time or other. An examination of the de Nicèville collection series only serves to confirm this. The small oval white spot in interspace 1 of the forewing said to be characteristic of **taoona** occurs singly or in pairs in more than one Himalayan insect and is not invariably present in those from Burma. The number of spots making up the white band on the hindwing varies (being either two or three) in specimens from both places. Nor are the other characteristics of **taoona** constant in the Burma insects.

It seems to me either that **patala** is to be found in Burma or that the two species are synonymous. In any case it is strange that there is no record of the species from the regions between Nepal and Upper Burma. Sikkim, the Naga Hills and the North Chin Hills have all been worked without any trace of the species being found.

Euthalia lubentina. Cramer.

The descriptions of this species in de Niceville's and Bingham's works make no mention of the rather prominent tufts of hair at the base of the hindwing of the male on the upperside. It belongs to the section having secondary sex marks of specialised scales; but in this species the tufts are prominent enough to call for notice in the description. These hair-like sex marks are also to be found in **E. phemius, E. garuda, E. jama** and **E. kesava**, but are less developed in those species.

Euthalia garuda. Moore.

The females of this species, as is well known, show a good deal of variation, but no mention has, as far as I can ascertain, been made of the fact that the various types are, to a large extent, localised. Except in the case of specimens from Northern India, I have not a sufficiently long series to make absolutely definite statements on, but my observations during collecting in various parts of India were extensive enough to justify the following remarks:—

Type I.—A very bright light-greenish brown on upperside, the basal half of both wings a shade darker than the outer half. The white discal spots on the forewing comparatively small, not extending below vein 4, and very indistinct. Submarginal row of black spots on hindwing small. Underside ochraceous throughout, not powdered with dark scales. Markings as on upperside. This type is the only one found in Northern India, and is probably the dry tract form. It also occurs occasionally in Bengal.

Type II.—Upperside of same general tint as in Type I., but richer and darker. Discal spots on forewing very white and distinct, consisting of an almost unbroken band to vein 4 and two well-separated spots in interspaces 3 and 2. Beyond the band a diffuse creamy powdering, and a whitish streak along costa from the uppermost spot to another very white spot halfway to apex. Subterminal black spots on hindwing very small, obsolescent.

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Underside greenish grey dusted with black scales, dark brown discal fascia, and terminal lilac shading very prominent. White spots as on upperside. This is the variety which very largely predominates in Bombay and Western India, and is possibly an approach to the **vasanta** form of Ceylon.

Type III.—Upperside a dark greenish brown, basal area still darker but not so regularly delimited from the lighter portion as in the other two types. The discal markings consist of three distinct white, well-separated spots beyond the cell, the two upper quadrate and moderately large, the lower very variable, and a fourth spot in interspace 3. A distinct white costal spot beyond the white band, and a well-marked dark subterminal fascia. Subterminal black spots on hindwing large and distinct. Underside basal half of wings much as in Type II.; outer half up to pale lilac edging darker brown, but no distinct fascia. White markings as on upperside but less distinct. This variety is the one most generally taken in Bengal and Assam; and some sent me from Maymyo in Upper Burma were of the same type.

Neptis eurynome. Westwood.

Indian lepidopterists are under a great debt of gratitude to Col. Bingham for his labours in overhauling and revising the numerous named varieties of the common Indian Neptis. His decision to sink all the inconstant varieties given specific rank into one species has cleared the air immensely. No one who has dealt with any number of these Neptes can have failed to observe the extent of variation and the utter impossibility of referring any but extreme types to any particular one of the many so-called species. Among all the forms now sunk under **eurynome** there is, however, one which perhaps deserves to be kept distinct, if only as a local race. This is the dark form with narrow white bands and chocolate coloured underside. It is more or less constant (the underside has sometimes a rusty or ochreous tinge, but is always quite different from the yellow or true **eurynome**) and is easily distinguishable both on the wing and in the cabinet. It is, moreover, essentially a hill insect, confined to the higher ranges of the Himalayas and Assam hills, and not occurring below 4,000 or 5,000 feet; whereas **eurynome** is found both in the plains and in the hills to 5,000 feet and more. As far as I can identify it, the hill form is the true **N. astola** of Moore.

Neptis mahendra. Moore.

Neptis yerburyii. Butler.

The differentiation of these two species is, in my experience, a far more difficult matter than, for instance, the separation of **N. eurynome** and **N. astola**. I have a long series before me, taken at various places from Mussoorie on the west to Shillong in the east; and were the prolongation or otherwise of the detached apical spot of the discoidal streak to be

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made the basis of separation, I really do not think it would be possible to arrive at any definite results. Indeed, the specimen in which the prolongation is least marked is a very yellowish one from Sikkim, where **mahendra** is not supposed to be found. All the points of difference noted by de Nicéville (**N. nandina**) and Bingham appear to me to break down at times, the only one of moderate constancy being the complete separation or otherwise of the spot and streak on the underside.

Neptis soma. Moore.

The numerous varieties collected by Bingham under this name form another difficult group. An examination of some scores of specimens collected in Assam and in the Sikkim and Bhutan Terais have led me to make the following note. Of those insects placed under true **soma** there appear to be two more or less constant and distinct varieties. The first and more common has very narrow and heavily sullied markings, the subterminal band in the hindwing so much so that it is only a shade lighter than the ground colour. This appears to be the species referred to **soma** by de Nicéville (Butt. of India, Vol. II, page 102). The second variety has all the markings pure white though narrow and small, and the submarginal row of the hindwing is made up of distinct, very clear white quadrate spots. It is probably the **adipala** of Moore. The undersides are practically identical. Both forms have been taken both in the dry season and at the height of the rains, so the differences cannot be altogether due to climatic dimorphism.

Neptis clinia. Moore.

According to Bingham, this local race of **N. soma** s confined to the Andamans. I have taken a couple of specimens, quite indistinguishable from others from the Andamans, in the Brahmaputra valley in Assam.

Neptis nashona. Swinhoe.

Hitherto only recorded from the Khasi Hills. I took an unmistakeable specimen in April this year in the forest country below Buxa, Bhutan.

Doleschalla bisaltide. Moore.

Doleschallia malabarica. Fruhstorfer.

Doleschallia andamanensis. Fruhstorfer.

The impossibility of satisfactorily separating, on the lines laid down by Bingham, a fairly long series of the genus in my collection from the Sikkim and Bhutan Terais, Assam, the Naga Hills and the Andaman Islands, led me to make a critical examination of the different species as represented in the Indian Museum and de Nicéville collections. These show that the character ascribed by Bingham to the race **malabarica**, (Fauna of India, Butt., Vol. I, page 392) *viz.*, the termination of the preapical fulvous band in interspace 5 of the forewing, holds good only in specimens from the Malabar Coast; and in these it seems absolutely constant. In the long series in the

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de Nicéville collection and in my collection from N. E. India and from the Andamans, the shape and extent of this preapical band vary enormously, though no clear dividing line is possible, the band always extends more or less into interspace 4, and, in the case of a female from near Gauhati, is so lengthened as to coalesce with the fulvous discal area in interspace 3. The only constant characteristic I can find in the insular race is that the truncate portion of the apex of the forewing is cut off square or slightly convex, while in all the N.-E. India specimens it is distinctly excavated or concave.

It seems to me that the N.-E. India form should stand as **D. bisaltide,** Moore, or **D. polibete,** Cramer ; the Andamans form should be sunk or, at best treated as a slightly differentiated local race **andamanensis;** and the Malabar insects placed as another well marked local race **malabarica.**

CYANIRIS, (genus). Dalman.

This is a very widely distributed genus, some representatives being found in every hill tract in India, Burma and the Indo-Malayan region. The Khasi Hills in Assam may, however, in some ways, be considered its stronghold in India, no fewer than ten of the twenty hitherto recorded Indian species occurring in or near Shillong ; and an eleventh and new one is now described. A few notes on each, with special reference to its appearance in these hills, are appended.

C. marginata. de Nicéville. Only taken July to September but common then. It has not so far been recorded from the tract between Sikkim and the hills of Upper Burma, but will probably be found at suitable elevations in all the Assam hills.

C. albocærulea. Moore. Local but fairly common, August to October. The first record of its occurrence east of Sikkim.

C. transpecta. Moore. Decidedly rare ; a spring or early summer species.

C. puspa. Horsfield. Very rare in Shillong but common at lower elevations in the hills all the year round.

C. placida. de Nicéville. Male very common but only taken in August to early October. Female very rare. One taken in company with a number of males is described, as no description appears in Bingham's work. Costa, termen and tornal area of forewing very broadly fuscous. Lower part of the cell dull blue but shining in certain lights. Hindwing, upperside, generally fuscous but with a small basal patch of the same dull blue and a slight irroration of blue scales over disc almost to termen. Underside as in the male.

C. chennelli. de Nicéville. Very common. A succession of broods from April to October.

C. victoria. Swinhoe. Recorded from the locality but not taken by me.

C. imbata. Moore. Fairly common but very local. There are apparently

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two distinct broods—one in April and May and the other in October. It disappears in the interval.

C. dilecta. Moore. Common. Apparently distinct broods in the spring and autumn.

C. jynteana. de Nicéville. Occasionally, April to July.

Cyaniris parishii. n. sp.

A new form, the only one of its kind among some hundreds of Cyaniris taken by Mr. H. M. Parish and myself in and round Shillong in 1909, and quite distinct from all the species of the genus in the Museum and de Nicéville collections. The specimen is a male and belongs to the group in which the costal margin is broadly edged with black. The description is as follows:—

Upperside.—Forewing, costa and termen broadly black, this black edging, except for about one-third from base of costa where it is narrower, and at apex where it is a trifle broader, being of almost exactly the same width all round and very regularly and evenly defined. The rest of the wing shining lavender blue, slightly deeper at base. There is just an indication of a black tooth on the discocellulars. Hindwing, costa broadly fuscous, termen narrowly but very evenly edged black, with a subterminal series of dark lunular markings. The rest of the wing of the same shade of blue as the forewing. Cilia dirty bluish white. *Underside.*—Ground colour dull white, markings small and delicate, of the usual Cyaniris pattern.

Expanse—1·2 inches.

Habitat—Shillong, Khasi Hills, 5,000 ft., August.

The species appears to be allied to **C. akasa,** Horsfield, from S. India, but has no trace of white on the upperside of the wings. It is also apparently close to **C. shelfordi,** de Nicéville, from Sarawak. This latter is of a somewhat deeper shade of blue, the black margins are not so even, and the markings on the underside are very much heavier and coarser.

Orthomiella pontis. Elwes.

Hitherto only recorded from Sikkim and Upper Burma. Also taken at Kohima, Naga Hills, 5,000 ft., April.

Lycænesthes emolus. Cramer.

I have a male of this species from the Bhutan Terai which is a striking aberration from the type in respect of the markings on the underside. In the forewing, the band on the discocellulars is not defined with white lines, and the discal band is very broad and regular. The hindwing is remarkable. All the irregular bands have coalesced into a uniformly brown patch, on which is placed a very light coloured greenish white discal fascia broken only by the brown nervures and a short brown band on the discocellulars. Subterminally there are prominent light coloured conical markings, and the usual black and orange crowned spot in interspace 3.

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Talicada nyseus. Guerin.

Specimens from the hills north of Sylhet have the red area on the hindwing much smaller in extent than those from Western India, and of a much deeper red.

Nacaduba ardates. Moore. nov. var. ? **dima.**

I have not been able to satisfactorily place a male Nacaduba taken by myself near the foot of the Naga Hills in April 1909. It is very near **N. ardates** (which is common in the locality) with which form it agrees in the basal striga on the underside of the forewing being extended below the median vein, in its small size (1″), and in being tailless. Its appearance above is, however, very distinct and quite different from any of the hundreds of **ardates** I have examined both in the course of my own collecting and in the Museum and de Nicéville collections; and there are, moreover, some points of difference in the markings on the underside. **N. ardates,** on the upperside, is always some dark shade of brownish purple-brown when looked at direct, a dull purple when seen at an angle. The variety is a bright bluish purple, somewhat like that of **Cyaniris jynteana,** with a shining, slightly frosted appearance in some lights. The underside is a dull dark brown, with all the transverse strigæ very indistinct, the basal one of the forewing being traceable only half across interspace 1. The large orange crowned black spot in interspace 2 of the hindwing, so prominent in all forms of Nacaduba, is here replaced by a small, inconspicuous black spot, subequal in size to that at the extreme tornal angle, the orange halo and metallic scales being altogether absent.

The form may be new; but **ardates** does vary somewhat, and pending further material and research, it is best treated as a well marked variety of that species.

Thecla leechii. de Nicéville.

The female of this rare species was described but not named by de Nicéville in the Journal of the Bombay Natural History Society, Vol. VI, page 374, as belonging to the genus **Satsuma,** Murray, and was named in a later article in Vol. VII, page 335 of the Journal. I have to record three more captures—all females—in Shillong, two by Mr. H. M. Parish now in his collection, and one by myself. Mr. de Nicéville's description, which is very clear, does not mention the small triangular patch of grey scales about midway up the dorsal margin on the underside of the hindwing, or the well developed lobe at the tornus. The species, the female at any rate, is tailless. It is decidedly rare and only appears very early in the spring, all the specimens having been taken in March or early April. It is curious that the male has not yet been discovered in the Khasi Hills.

Ilerda epicles. Godart.

The usual colouring of the male of this very common species is a some-

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what dull purple or brown with a purple reflection, with often an orange spot just beyond the cell of the forewing. Two specimens from 3,000 ft. in Sikkim and one from Shillong, however, show a reflection of an intenser, much purer *blue*, quite unlike the tint of typical **epicles**, and there is no trace of the orange spot. A female taken in company with one of these males also differs from the ordinary females of **epicles** in having the preapical orange band on the forewing narrow, and the lunular red terminal border on the upperside of the hindwing very linear and reduced. The undersides of the two forms are identical.

There are a few insects of the same colouring in the de Nicéville collection under the name **phœnicoparyphus**, Holland, also from Sikkim. This latter species has not been included in the genus in de Nicéville's Butt. of India, and I cannot say whether he finally decided to keep it distinct. An examination of the genital organs will settle the matter.

Ilerda viridipunctata. de Nicéville.

Ilerda brahma. Moore.

Both these species are fairly common in Sikkim, but the dividing line in the altitudes at which they are respectively found is rather striking. **I. viridipunctata** is never found below 6,000 ft.; below this one seems to come at once into the **brahma** habitat. In Kumaon, the latter ranges higher, having been taken at about 7,000 ft.

Camena ister. Hewitson.

de Nicéville, in Butt. of India, Vol. III, page 344, only describes the female: and in the Journal of the Bombay Nat. Hist. Soc., Vol. VII, page 335, and pl. H, fig. 10, he describes and figures the male of a new species as **C. carmentalis**, remarking that the latter "is not improbably the latter sex of **C. ister.**" The examination of a fairly long series of both brought in by native collectors from Cherrapunji in the Khasi Hills leaves no doubt in my mind that **C. carmentalis** *is* the hitherto undescribed male of **C. ister**; and the former name must therefore be sunk.

Tajuria istroidea. de Nicéville.

So far only recorded from Sikkim. Also occurs rarely in the neighbourhood of Cherrapunji.

Zeltus etolus. Fabricius.

This is one of those species in which the male is extremely common while the female is very rare. The former may be taken literally by hundreds all over the Sikkim and Bhutan Terais and near the foot of the Assam hills; but in all my collecting I have never yet seen a female.

LOXURA (genus). Horsfield.

I have species of this genus from the North-Western sub-Himalayas, the Sikkim and Bhutan Terais, Assam, the Western Ghats and from the Andaman Islands; and have endeavoured to trace the characteristics on

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which the species **surya**, Moore, and **prabha**, Moore, were founded. I have failed completely. **L. arcuata** from Ceylon I have not seen. There seems to be no doubt, as de Nicèville surmised, that all the Indian insects represent only one inconstant species.

Deudorix epijarbas. Moore.

An aberrant specimen from Shillong has all the fasciæ on the underside of both wings placed on a white ground.

Papilio mayo. Atkinson.

A very distinct variety from the type of the male is to be found. In this the internervular streaks on the upperside of the forewing and the red basal patch on the underside of the same wing are completely absent ; and the red basal patch on the underside of the hindwing is very much reduced. The most striking variation is, however, the absence, on the underside of the hindwing, of the red subterminal ocelli in interspaces 1 and 2 and the red scaling on the disc. In place of the latter there is a very prominent set of pure blue lunular markings, set on a deep blue black ground, and extending in a curve from the costa to the dorsum. Of five males received from the Andamans, three were of this type, the other two being normal.

Col. Bingham was slightly in error when he stated that the cilia of the forewing were black throughout. They are touched with white between the veins, though not nearly so conspicuously as in the hindwing—in fact, the white cilia cannot be seen at all, unless the wing is looked at edgewise.

Papilio axion. Felder.

Bingham places all the North-East India and Andaman insects under **axion** ; but the forms from the two localities are clearly distinct. His description of **axion** applies properly only to specimens from the Andaman Islands ; insects from Sikkim and Assam (where the species is very common) are, as a rule, rather smaller and differ somewhat in facies. The discal pale green band is, in the N. E. form, always narrower and less compact, and very irregular exteriorly ; and there are always present, along veins 6 and 7 on the upperside of the hindwing, one or two pale linear streaks interior to the submarginal row of spots, which are not present in any of the Andaman insects I have seen, either in my own collection or in the long series in the Indian Museum collections. On the underside of the hindwing, the pearly sub-basal streak from the costa is always extended evenly to coalesce with the discal band in typical **axion** this streak is somewhat irregular, macular and invariably well separated from the discal band ; the crimson markings beyond the discal band are small and variously shaped—in **axion** they are fairly large and regularly quadrate ; the black discal spots are also very small and placed *on* the red markings, and never completely fill up the base of the interspaces, separating the red

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markings from the pale discal band as is the case in all the Andaman examples.

These differences are constant in all the specimens I have examined; and I have no doubt as to the distinctness of the two. The insular race is undoubtedly **axion**; the N. E. India form is either the race **jason**, Linnæus, or the parent form **eurypylus**, Linnæus.

Huphina nadina. Lucas.

Huphina andamana. Swinhoe.

Several males I have received from the Andaman Islands are absolutely indistinguishable from typical **nadina**, the lacuna of pale colouring in and beyond the cell on the underside of the hindwing being exactly the same as in **nadina**. This is the characteristic on which **andamana** has been given specific rank, but it does not appear to be constant.

Appias lagela. Moore.

This race of **A. lalage**, Doubleday, has hitherto only been recorded from the Arakan Coast, Lower Burma and Tenasserim. A male, agreeing exactly with the description of the form in Bingham's Fauna, Butt., Vol. II, page 209, and with the specimens in the de Nicéville collection, was taken by me on the Peak, above Shillong, 6,000 feet, in October.

The dry season form of **A. lalage** is exceedingly common on the higher ranges of the Khasi Hills at this period of the year; and it may be that **A. lagela** occurs more frequently than a single capture would indicate, but is overlooked in its resemblance to **lalage**.

Terias silhetana. Wallace.

I have a very quaint aberration of the wet season variety of this species, taken in the Bhutan Terai. The ground colour on the upperside is a very light cream—almost white—but patches and specks of the ordinary rich citron yellow are scattered irregularly and sparingly about the wings, giving the insect a most bizarre appearance.

Celænorrhinus spilothyrus. Felder.

In a short paper on the Butterflies of the Konkan some time ago (Journ., Bom. Nat. Hist. Soc., Vol. XVIII, page 884), I mentioned **C. fusca**, Hampson, as being found in the Western Ghats. I have recently been analysing and working out a key to the genus, and find that the Khandala insect is **C. spilothyrus**.

Similarly the **Coladenia tissa**, Moore, I recorded from Khandala turns out to be **C. indrani**, Moore.

Coladenia fatih. Kollar.

Watson sinks this to **C. dan**, Fabricius, as do other writers; Mr. de Nicéville considered it distinct. I have examined a fairly long series of both forms and find that the one from the Western Himalayas (true **fatih**) has the hyaline spot at the base of interspace 3 of the forewing subtrian-

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gular and constantly wider than high, thus ; in the eastern form (**dan**), this spot is always quadrate and higher than wide, thus . The western insect is also appreciably larger and lighter coloured. **C. fatih** seems sufficiently distinct to be treated as a local race.

SATARUPA (genus). Moore.

DAIMIO (genus). Murray.

Watson in his Key to the Asiatic Hesperidæ (Journ., Bom. Nat. His. Soc., Vol. IX, page 421) separates **Satarupa** from **Daimio** on the strength of the pencil of hairs on the hind tibiæ of the male of **Daimio.** This, however, is not a satisfactory division ; for in **gopala,** the type of **Satarupa,** this pencil of hairs is strongly developed. It is absent only in **sambara,** Moore, and its allied form **dohertyi,** Watson, which two also differ from all the other Indian species of the genus in having white palpi.

TAGIADES (genus). Hubner.

Watson, in his paper already quoted, gives the strongly arched lower margin of the cell between veins 2 and 3 of the forewing as a constant characteristic ; but it does not always appear to hold good and is often very hard to distinguish. A more constant feature (though facies is never a very satisfactory one for the discrimination of genera) is the colouring of the hindwing, which, in one group, is broadly white on both sides ; and in another and more soberly coloured group, is always suffused with white or bluish white scales on the underside.

Caprona ransonnettii. Felder.

Caprona saraya. Doherty.

The distinctness of these two is doubtful. The latter was described from a single male, and separated from **ransonnettii** on the presence of a basal hyaline spot in the cell of the forewing (which **ransonnettii** has not got) and the absence of all white on the disc of the hindwings below. As records of distribution go, **ransonnettii** is the southern and eastern form and **saraya** the north-western one ; but four specimens taken by me at different places at the foot of the N.-W. Himalayas *are* suffused with white below and have no basal spot in the cell of the forewing. They are thus indentical with typical **ransonnettii,** and, in fact, de Nicéville himself diagnosed two of them as this species. **C. ransonnettii** does, therefore, extend to the Western Himalayas, and **saraya** was possibly a casual aberration.

Parnara (genus). Moore.

Any analysis of the species of this difficult genus depends very largely on the markings on the male insect, and it is therefore important to be

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able to discriminate between the two sexes not always an easy matter without dissection and microscopical examination, as my own experience has proved. There are no secondary alar sex marks, nor do the leg characters furnish much help. It was therefore with considerable satisfaction that I observe one feature of the male which is easily found with a good lens and which, being absolutely characteristic of the male only, affords quick recognition. This is a peculiar appendage, consisting of a brush-like ring of very fine hairs or bristles, radiating from an oval or circular head, placed *in* the anal orifice and always more or less clearly visible. It very probably is an appendage of the genital organs.

An exactly similar organ is to be found in the males of the closely allied genera *Baoris*, Moore, and *Chapra*, Moore, which have, in addition, alar sex marks. It was the discovery of these in the males of *Baoris* that led me to make a close examination through the *Parnara* species.

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FURTHER NOTES ON SNAKES FROM THE CHIN HILLS.

BY

CAPTAIN F. E. W. VENNING.

(WITH NOTES BY MAJOR F. WALL, I.M.S., C.M.Z.S.)

During the present year (1910) only one addition was made to the number of species obtained from this locality, namely a specimen of the genus *Typhlops*, but the writer was fortunate enough to procure several more specimens of the new *Tropidonotus* described last year by Major Wall. Such other notes as are thought to be of interest are added under the various species.

Typhlops diardi.—One gravid female (No. 52-10) was captured on the main road near Minkin (5,600 ft.) on the evening of 13th June at dusk. When first handled this little creature lashed backwards and forwards head to tail very rapidly and with sufficient force to raise its body completely from the ground, in much the same way that some earthworms will do when touched. It is not perhaps unreasonable to suppose that this performance, which looks as if it must be uncommonly unpleasant for the actor, is a protective device of nature evolved from a simple instinctive shrinking or wriggling effort to regain liberty after capture. The writer well remembers the uncanny appearance presented by a large millipede in the Malay States, which adopted the same tactics when disturbed and seemed to be seized with a bad fit, thereby producing in the mind of the would-be captor an unwillingness to touch it, even though it was known to be quite harmless. The length of the snake was 14 inches including the stumpy tail which was broader than long. There were 26 rows of scales round the body anteriorly, and 28 rows at midbody. Colour shining brown above, each scale with a paler submarginal crescent; beneath whitish. It contained some well developed eggs.

[Many of the snakes to which these notes refer have been submitted to me by Capt. Venning for my examination. The specimen referred to as *Typhlops diardi* exactly agrees with the small specimen I obtained in the Khasi Hills which I made the type of a distinct species under the name

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tephrosoma (Bomb. N. H. Jourl., Vol. XVIII, p. 314). In Capt. Venning's specimen I find the costal rows 28 anteriorly, and in the whole body except before the vent for a short space where they are 26. The rostral does not reach back as far as the eyes, and these organs are very indistinct. The colour dorsally is dark brown, belly lighter with a series of distant, irregularly spaced, white, ventral, median spots. I notice that the præfrontal is nearly twice as long as the other superior shields. The frontal is rather the smallest shield. The supraocular is rather broader than the other shields. There are two enlarged temporals, and the parietal touches one scale behind on the left side, two on the right. The lateral breadth of the body is $\frac{1}{34}$ that of the total length. I still think that this form (*tephrosoma*) deserves to rank as a species very closely allied to *diardi*. It is noteworthy that *diardi* is a very common snake, and up till now no single specimen has been recorded with 28 scale rows. The specimen is further interesting in that it is gravid. It contains now 5 (I think) eggs. Capt. Venning had extracted one, and I extracted another, so the full complement appears to be 7. Capt. Venning called my attention to the presence of a small embryo within the egg, and I am able to confirm his observation. The egg I examined measured 17mm., in length, and 10mm. in breadth. On the vertebral aspect a small chamber was discovered in the yolk just beneath the investing membrane. This measured 5mm., in diameter and contained a small embryo, the head, and eye, and a bulbous process (the heart?) being very distinctly visible, the body behind being spirally twisted. The whole might have measured 1½ inches unravelled. The condition is exactly that noted and figured by me in this Journal (Vol. xix, p. 784) with reference to the eggs of the tree snake *Dendralophis tristis* and suggests the probability that the eggs may be discharged as such. Further observations are however necessary to negative the idea of a viviparous habit.

F. WALL.]

Blythia reticulata.—Three specimens are perhaps noteworthy. No. 55/10 was an immature specimen taken on 19th June under a heap of stones on the rifle range (6,600 ft.), where also another small one was seen but managed by its remarkable agility to escape minus the tip of its tail. The specimen captured was 5·75 inches long (tail ·7 inch) and was coloured similarly to all the adult specimens seen here. On the other hand one taken last year in April at Fort White was smaller in size (4·4 inches) and was white beneath. These facts coupled with the undeveloped state of the embryos in the next specimen which was taken in July

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seem to point to the hatching season being some time in the cold weather or early spring.

No. 58/10 taken at dusk on 9th July was a gravid female of remarkable size, measuring 20·25 inches of which the tail was 2·5 inches. It contained six, large creamy eggs placed in a single longitudinal row and measuring about ·8 by ·4 inch. The two nearest to the vent were in the left ovary, the remainder in the right. The two examined showed no signs of any embryonic development. No. 63/10 captured on 26th July was also a large one (18·9 inches in length), and contained an earthworm in gastro.

Oligodon dorsalis.—One immature specimen (54/10) was found under a flowerpot stand against the wall of my house on 17th June. Its length was 6 inches including the tail, which accounted for ·9 inch. The ventrals were 162 and the subcaudals 40. A full-grown specimen (No. 61110) taken on 16th July was 17·75 inches long, tail 2·75 inches, and had 182 ventrals and subcaudals 41 pairs. The costal rows in all the specimens from this locality diminish to 13 posteriorly by the absorption of the 3rd and 4th rows above the ventrals as remarked by Major Wall in Vol. XVIII of the Society's Journal.

In all the specimens collected here the nostril has been found to be pierced in an undivided nasal, and not as stated in the "Fauna of British India" volume on Reptilia. All the specimens have had the bright yew-berry red colour beneath the tail, and the vertebral stripe chestnut.

Pseudoxenodon macrops.—Four specimens as below :—

No.	Date.	Length.	Tail.	Ventrals.	Subcaudals.
47/10	20th May	29·5	6·5	160	62 pairs
49/10	26th „	31·5	6·25	175	67 „
62/10	18th July	26	5	155	60 „
66 10	31st „	39·25	8	177	78 „

The costals are reduced from 19 to 17 rows at midbody by the union of the 3rd and 4th rows as remarked by Major Wall in Volume XVIII, page 321, the next reduction to 15 occurring in the same rows quite close behind midbody. No. 62/10 is abnormal in the number of labials, having six on the right and seven on the left instead of the usual eight. No. 47/10 was a gravid female

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embryos undeveloped in the eggs which were six in number and of a creamy-white colour the largest measuring 1·5 by ·5 inch. The usual colouring of this species here is a rich chestnut rather than olive with a dorso-lateral series of black spots, the opposite pairs connected across the back by a pale (buff) saddle or bar.

Tropidonotus subminiatus.—Two were captured, both gravid females. No. 48/10 was taken on the 23rd May and contained some eggs, less than half an inch long, while No. 53/10 caught on 16th June had much larger eggs, six being found in each ovary. In both these specimens only two supralabials touch the eye, and this is so common an aberration that it fails entirely as a distinguishing feature from the nearly allied *himalayanus*. No. 53/10 had nearly all the supralabial sutures black. It was first seen lying on its back having swallowed the right hind-leg of a toad (*Bufo melanostictus*) which was making every endeavour to escape and had evidently dragged the snake down a low bank overturning it in the fall. The victim measured three inches from snout to vent and some two and-a-half inches across. The snake had already made a meal on a lizard, the remains of which were found in gastro. The ventrals and subcaudals in the two specimens were as follows :—

No. 48/10	Ventrals 165	Subcaudals 92 pairs.
No. 53/10	„ 162	„ 61 „

No. 48/10 had four postoculars on right.

Tropidonotus himalayanus.—Two specimens.

No.	Date.	Length.	Tail.	Ventrals.	Subcaudals.
59/10.	12th July.	27·25.	7·25.	157	85 pairs.
65/10.	29th „	29·5.	4·75.	154	87 „

The latter had eaten a frog. In both all the supralabials were black sutured. No. 65/10 had a beautiful yellow collar, while the other had only traces of it in a few yellow spots on the nape.

Tropidonotus venningi. (Wall.)—Five specimens.

No.	Date.	Length.	Tail.	Ventrals.	Subcaudals.
41/10	12th March	29·5	9	164	108 pairs.
43/10	20th April	25·5	7·4	169	100 „
57/10	26th June	22·75	7·75	162	126 „
64/10	27th July	25·75	7·5	161	110 „
68/10	8th August	27	8·25	166	121 „

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No. 43/10 is anomalous in the costals, the rows being reduced to 15 posteriorly owing to the occurrence of some enlarged scales in the lowest rows on either side. At a point nearer to the vent than two heads' lengths there are 16 rows, the absorbed rows reappearing and disappearing again. No. 41/10 was a female with some six eggs, the largest measuring ·5 inch long by nearly ·25 inch across. Nos. 57/10 and 68/10 were also gravid females. Two of the specimens struck fiercely when being captured and one (No. 68/10) progressed in leaps by raising the anterior half of its body and throwing it forward in its attempts to avoid capture. The secretion of the anal glands was found to be white of the consistency of white enamel paint. No. 64/10 and perhaps No. 43/10 have the tip of the tail broken. In No. 68/10 the second subcaudal from the vent is entire. In the region of the vent all the costals, even the outermost rows, showed traces of keels.

[I have disected out the skull of one of these specimens, and find the dentition as follows :—

Maxillary.—There is no gap in the series behind, and the teeth number 29 on each side. The last 3 are very slightly enlarged, and compressed. *Palatine.*—16, subequal. *Pterygoid.*—19 on right side, 20 on left, subequal. *Mandibular.*—32 on the left side, 29 on the right, from which a fragment is broken posteriorly that would probably support 3 teeths.—F. Wall.]

Psammodynastes pulverulentus.—No. 44/10 found under a boulder on 2nd May was a female containing eggs without any distinct traces of development. Length 24 inches, tail 4·25 inches. The costals were 17-17-15, ventrals 161 and subcaudals 58 pairs. An anomaly is the divided anal shield. There are three postoculars. Two loreals, the lower small, and the upper large subtriangular and nearly reaching the eye. The general colour was dark brown, the head vermiculated with white and grey and having a broad ivory white band from the rostral passing below the eye but not on the labial margin. This band disappears actually on the sides of the neck and reappears as small widely separated white spots on the ends of the ventrals and subcaudals. A row or three or four white spots on the infralabials on both sides and some similar spots on the sublinguals. Beneath it is whitish anteriorly, darker posteriorly powdered with bluish grey and having two longitudinal bluish lines.

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Ingested was found the remains of a large "*Ophisaurus gracilis*," swallowed head foremost as seems usual.

Callophis macclellandi. (var: typica).—One specimen (51/10) was found in a nullah with its head much battered on 2nd June. Its length was 27·5 inches, tail 2·25 inches. The ventrals were 200, and subcaudals 20. The head had the usual ivory white band; the black bands were 25, of which 2 were on the tail. In addition there was a dorso-lateral series of black spots intermediate between the black bands. These spots commence after the 5th band and occur after each band except the 8th and 9th and the last on the tail, but the spot on the left after the last band but two and the last but one on the body has disappeared, and in these two places the intermediate black blotch of the belly has become distorted upwards on to the flank.

Lachesis monticola.—Three specimens—

No.	Date.	Length.	Tail.	Costals.	Ventrals.	Subcaudals.
50/10	29th May	12·5	1·5	25-25-21	150	39 pairs
56/10	23rd June	15·75	1·75	27-25-21	151	35 „
60/10	15th July	12	1·75	23-23-19	147	46 „

In the two first cases a shrew had been swallowed. The last had some abnormalities in the subcaudals as follows:—the 1st to 6th from the vent are entire, the 7th to 15th divided, and the 16th to 22nd entire. The supracaudals were in even rows unaffected by these anomalies.

Lachesis jerdoni—

No.	Date.	Ventrals.	Subcaudals.	Supralabials.
42/10	17th April	172	58 pavis.	7 on right, 8 on left.
46/10	17th May	164	55 „	7
67/10	31st July	181	23 „	8, 4th on left minute.
67/10	had tail broken.			

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ON THE BIRDS OF KOHAT AND THE KURRAM VALLEY, NORTHERN INDIA.

BY

LIEUT. C. H. T. WHITEHEAD, Indian Army.

With an Introduction by MAJOR H. A. F. MAGRATH, Indian Army.

PART II.*

(*Continued from page 197 of this Volume.*)

[558.] HEMICHELIDON SIBIRICA. The Sooty Flycatcher.

Fulton, J. B. N. H. S. xvi., p. 50 (Chitral, 4,000 ft.); Rattray, t. c. p. 427 (common above 8,000 ft. on Murree Hills); Ward, op. cit. xviii, p. 479.

250. ♂ ad. Kohat, 1,768 ft., 9th May.

Capt. Keen shot this bird in our garden on the 8th of May. In the course of the following week I came across several more. It nests commonly in the forests of the Safed Koh up to tree-limit.

[561.] SIPHIA PARVA. The European Red-breasted Flycatcher.

Marshall, J. B. N. H. S. xiv., p. 603 (Quetta: common in April); Fulton, op. cit. xvi., p. 50 (common in Lower Chitral in winter, leaving in mid-April).

715. ♂ ad. Kohat, 1,768 ft., 20th March.

Major Magrath has made the following notes on this species:—"A winter visitor abundantly reinforced during the spring migration. The rush north-west is at its height in the middle of April and continues till the end of the month. The last birds remain till well into May. The adult males are the first to leave, the females and immature birds following two or three weeks later. The return migration commences in October. Few examples with chestnut breasts are to be seen at this season. This Flycatcher constantly descends to the ground to take its prey."

In autumn I have seen it as early as Sept. 13th. We did not meet with a single adult male in winter, the first appearing about the middle of March.

[567.] CYORNIS LEUCOMELANURUS. The Slaty-blue Flycatcher.

Ward, J. B. N. H. S. xvii., p. 480 (very plentiful in Kashmir).

627. ♂ ad. Kohat, 1,850 ft., 1st March.

This solitary example was the only one met with. Its alarm-note (*tit-it-it*) attracted my attention.

[568.] CYORNIS SUPERCILIARIS. The White-browed Blue Flycatcher.

* The arrangement and nomenclature followed are those of Oates and Blanford's "Birds" in the 'Fauna of British India.' The numbers in square brackets before each name are the same as in that work.

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Rattray, J. B. N. H. S. xvi. p. 427 (common in Murree Hills); Ward, op. cit. xvii. p. 480 (plentiful).

528. ♂ ad. Kurram Valley, 7,500 ft., 24th April.

A rare bird. I shot one near Kohat on the 13th of April, and this was the only example seen in the plains. A second I got near the Peiwar Kotal, and believe that I heard one or two more close by.

[*Culicicapa ceylonensis* (Sw.). Major Magrath shot an example of this species, which is now in the National Collection, in Bannu, in October, and has since found it a fairly common winter visitor.]

[589.] ALSEONAX RUFICAUDUS. The Rufous-tailed Flycatcher.

Fulton, J. B. N. H. S. xvi. p. 50 (shot two in April); Ward, op. cit. xvii. p. 480 (breeds at high altitudes in Kashmir).

Abundant in summer on the Peiwar Spur, and in the Spin Khwar Nullah of the Safed Koh, from 8,000 to 11,000 feet. As Major Magrath has pointed out, it is quite likely that this species occurs in Kohat in winter, but from its remarkable likeness to the female *Ruticilla rufiventris*, has been overlooked. It may be distinguished from the latter by its not shaking its tail. It is a good songster with a great variety of notes.

[598.] TERPSIPHONE PARADISI. The Indian Paradise Flycatcher.

Marshall, J. B. N. H. S. xiv. p. 606 (shot one in May near Quetta); Fulton, op. cit. xvi. p. 50 (an uncommon summer visitor up to 5,000 ft.); Ward, op. cit. xvii. p. 480 (common in summer).

A fairly common summer visitor, arriving early in April, leaving towards the end of September, nesting freely in the shady orchards of Kohat.

[608.] PRATINCOLA CAPRATA. The Pied Bush-Chat.

Rattray, J. B. N. H. S. xii. p. 339 (Thall: scarce); Marshall, op. cit. xiv. p. 603 (Quetta: common in summer); Fulton, op. cit. xvi. pp. 50 & 744 (resident in Chitral); Cumming, t. c. p. 687 (Seistan: a scarce summer visitor); Betham, t. c. p. 750 (common); Ward, op. cit. xvii. p. 480 (rare in Kashmir).

A fairly common summer visitor from the second week in March till October, but not found much above 3,000 feet in the Kurram Valley.

[610.] PRATINCOLA MAURA. The Indian Bush-Chat.

Rattray, J. B. N. H. S. xii. p. 339 (abundant at Thall in April); Marshall, op. cit. xiv. p. 603 (a few at Quetta in April); Fulton, op. cit. xvi. pp. 50 & 744 (shot one at 6,000 ft.); Rattray, t. c. p. 467 (common in Murree); Ward, op. cit. xvii. p. 480 (common up to 7,000 ft.).

722. ♂ ad. Kohat, 1,768 ft., 21st March.

Passes through Kohat in force from February till mid-May, returning in small numbers in August and September; a few stragglers remain for the winter. Nests freely on the Samana and in the Kurram Valley from 5,000 to 7,000 feet. I have shot a recently fledged young bird as high as 9,000 feet.

[618.] SAXICOLA PICATA. The Pied-Chat.

Marshall, J. B. N. H. S. xiv. p. 480 (Quetta: common summer visitor);

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Betham, op. cit. xvi. p. 750 (nests freely); Ward, op. cit. xvii. p. 480 (scarce Kashmir); Perreau, op. cit. xviii. p. 186 (occurs in Chitral).

A fairly common winter visitor to the District from October till the end of March, chiefly frequenting stony wastes and hill-sides, and particularly common between Lachi and Latammar. Nests freely on the Samana. Capt. Keen found a nest on the 14th of May containing six fresh eggs. A beautiful songster, singing both on the wing and on the ground.

[619.] SAXICOLA CAPISTRATA. The White-headed Chat.

Rattray, J. B. N. H. S. xii. p. 339 (common in winter at Thall: many young birds seen at Parachinar in July); Marshall, op. cit. xiv. p. 603 (shot one at Sibi, 5,000 ft., in Feb.); Fulton, op. cit. xvi. p. 50 (occurs in Chitral in summer from 7,000 to 11,000 ft.); Cumming, t. c. p. 687 (shot one in March: Seistan).

302. ♂ juv. Parachinar, 5,700 ft., 7th July.

435. ♀ ad. Banda, 1,900 ft., 27th January.

A cold-weather visitor to the District and very abundant from the third week in August till April, frequenting both desert country and open cultivated lands and especially common by the roadside. In the Kurram Valley it nests freely round Parachinar from 4,500 to 6,500 feet, and rarely as high as 9,000 feet. The nest, a neat grass structure, is usually placed in a hole in the bank of a nullah or under a stone in the nullah-bed, occasionally in a cairn of stones. The eggs are pale blue, varying a good deal in shade, marked with red spots also varying much in shade, and distribution, and average ·79 in. × ·53 in. The full clutch is five. Two broods at least are reared in the season.

[620.] SAXICOLA OPISTHOLEUCA. Strickland's Chat.

Fulton, J. B. N. H. S. xvi. p. 50 (the commonest bird in Chitral, moving up or down according to season); Ward, op. cit. xvii. p. 480 (migrates through Baltistan).

433. Ad. Hangu, 2,700 ft., 27th December.

A fairly common cold-weather visitor from September to the middle of April, keeping chiefly to stony ground. It migrates through the Kurram Valley in April.

SAXICOLA MORIO, Hempr and Ehr. The Eastern Pied-Chat.

702. ♀. Kohat, 1,768 ft., 18th March.

This was the only example secured, but, owing to its close resemblance to *S. capistrata* the bird has probably been overlooked.

[625.] SAXICOLA ISABELLINA. The Isabelline Chat.

Rattray, J. B. N. H. S. xii. p. 339 (Thall: found a nest at 4,000 ft.); Marshall, op. cit. xiv. p. 603 (common in summer, nesting down holes); Cumming, op. cit. xvi. p. 688 (Seistan: fairly common in spring); Betham, t. c. p. 748 (Quetta: numerous, nesting in rat-holes); Ward, op. cit. xvii. p. 481 (Baltistan).

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A common cold-weather visitor to the desert parts of the District from August till April.

[626.] SAXICOLA DESERTI. The Desert Wheatear.

Marshall, J. B. N. H. S. xiv. p. 603, & xv. p. 355 (Quetta: found a nest with young in a bank); Cumming, op. cit. xvi. p. 688 (one shot in January); Ward, op. cit. xvii. p. 481, & xviii. p. 462 (occurs in Kashmir in spring and in Ladak in summer).

618. ♀ ad. Kohat, 1,760 ft., 28th February.

Fairly common from November till the third week in March, but not such an exclusive haunter of the desert as some of its allies, being frequently met with about cultivated lands.

[628.] SAXICOLA CHRYSOPYGIA. The Red-tailed Chat.

Watson, J. B. N. H. S. xv. p. 145 (shot in September near Chaman); Perreau, op. cit. xviii. p. 186 (Chitral).

Common in the cold weather from September to mid-April about low stony hills.

[638.] CHIMARRHORNIS LEUCOCEPHALUS. The Whitecapped Redstart.

Rattray, J. B. N. H. S. xii. p. 340 (January); Fulton, op. cit. xvi. p. 744 (rather rare); Ward, op. cit. xvii. p. 481 (common in Kashmir).

Occurs in the Miranzai Valley from Raisan upwards from October to the middle of April, but is somewhat rare. Abundant, however, in summer along the torrents of the Safed Koh up to tree-limit.

[642.] RUTICILLA ERYTHRONOTA. Eversman's Redstart.

Marshall, J. B. N. H. S. xii. p. 603 (common in winter); Ward, op. cit. xvii. p. 481 (occurs in spring).

51. ♀ ad. Raisan, 2,360 ft., 25th December.

100. ♂ ad. Kohat, 1,760 ft., 4th February.

Fairly common, especially in the Miranzai Valley, from December till March, and on the Samana from October till the end of March, chiefly frequenting scrub-jungle, olive-groves, and avenues. The call is a peculiarly croaking note sounding like *gre-er*. The male assumes nearly full breeding-plumage before leaving. Not observed in the Kurram Valley.

[644.] RUTICILLA RUFIVENTRIS. The Indian Redstart.

Marshall, J. B. N. H. S. xiv. pp. 603, 606 (a common resident up to 11,000 ft. in summer); Fulton, op. cit. xvi. p. 51 (common from 9,000 to 14,000 ft. in July); Ward, op. cit. xvii. p. 481 (nests in Ladak).

A winter visitor, abundant from September to mid-April, but only occurring on the Samana on passage. A few pairs nest on the Safed Koh above 10,000 feet. The nest is usually well concealed under a stone or sometimes in a hollow in a bank, and is made of bents and grass lined with hair. The eggs are very pale blue without markings, and vary much in size. The full clutch appears to be five.

[646.] RHYACORNIS FULIGINOSUS. The Plumbeous Redstart.

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Fulton, J. B. N. H. S. xvi. p. 51 (a common resident in Chitral from 4,000 to 7,000 ft.); Rattray, t. c. p. 428 (common in the Galis); Ward, op. cit. xvii. p. 481 (very common on all hill-streams).

660. ♀. Kachai, 2,700 ft., 9th March.

Major Magrath observed this Redstart by the Khanki River at Raisan in October 1905; this is the only example of the species we have noted except for the above one which I procured at Kachai.

[647.] CYANECULA SUECICA. The Bluethroat.

Marshall, J. B. N. H. S. xiv. p. 603 (common in March and April at Quetta); Fulton, op. cit. xvi. p. 51 (common in September and October); Ward, op. cit. xvii. p. 481 (common in Kashmir).

Passes through the District and up the Kurram Valley in large numbers from March till the end of May. The return passage, commencing in the last week of August, is at its height in September. A certain number of immature birds winter in Kohat, and are then chiefly found in the reed beds.

[654.] IANTHIA RUFILATA. The Red-flanked Bush-Robin.

Ward, J. B. N. H. S. xvii. p. 481 and xviii. p. 462 (breeds in Kashmir).

95. ♀ ad. Kohat, 1,760 ft., 21st January.

669. ♂ ad. Kachai, 2,700 ft., 12th March.

A rare winter visitor to the Samana and the orchards of Kohat and Miranzai. Capt. Keen was the first to meet with it. Fairly numerous on the wooded slopes of the Safed Koh from 8,000 to 10,000 feet in summer. The alarm note resembles the syllable *prot*, the mate answering *ee* (both notes are used by the two sexes). The short song is one of the familiar sound of the forest, it may be rendered "*Pray did he then?*"

[657.] ADELURA CÆRULEICEPHALA. The Blue-headed Robin.

Fulton, J. B. N. H. S. xvi. p. 51 (resident: Chitral); Rattray, t. c. p. 428 (very rare, nests in holes in stumps: Murree Hills); Ward, op. cit. xvii. p. 481 (occurs in April; Kashmir).

A winter visitor to the District from December till mid-March, and to the Samana from the first week in November till the end of March, but in varying numbers. In 1906 and 1907 it was fairly common but in 1908 I only met with one specimen. Usually frequents olive-groves and gardens, and on the Samana scrub-jungle. In the woods of the Safed Koh, however, it is abundant in summer from 7,500 to 12,000 feet. It has the tame and confiding habits of the Redbreast, and the same way of quivering the tail. The alarm-notes, too, are very similar. The two nests that I came across might well have been those of the Redbreast. The first was placed on the ground under shelter of a juniper-root (not in a hole) at 11,000 feet, and contained three eggs just hatching; they were cream-coloured, with a darker zone near the larger end, and differed a good deal in size. The second was in a similar position at 8,000 feet, and had four eggs of similar type, but very faintly tinged with green and slightly smaller, averaging ·68 × ·48".

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[661.] THAMNOBIA CAMBAIENSIS. The Brown-backed Indian Robin.

Rattray, J. B. N. H. S. xii. p. 340 (a common resident); Ward, op. cit. xvii. p. 481.

686. ♂ ad. Kohat, 1,760 ft., 16th March.

A fairly common resident in the plains. As Major Magrath notes, it differs from its down-country relatives in shunning gardens and cultivated spots, preferring arid stony localities, and shewing a marked partiality for graveyards. It does not ascend the hills to any height, and in the Kurram Valley we did not find it above 3,000 feet.

[666.] MERULA MAXIMA. The Central Asian Blackbird.

Ward, J. B. N. H. S. xvii. p. 482 (breeds in Kashmir at high altitudes).

295. Juv. Safed Koh, 10,500 ft., 1st July.

Bill, gape, and eyelid brownish yellow; tarsus fleshy brown; iris brown.

Apparently very rare, this example being the only one met with.

[In July 1908 I found this fine bird fairly common outside our limits near the head of the Kaghan Valley (Hazara, N.-W. F. P.) between 12,000 and 13,500 feet, in parties of from three to ten, or occasionally alone. It was very wild, and it was with difficulty that I procured three examples (now in the British Museum). On revisiting this valley in May and June 1909, I found it nesting freely in the juniper-scrub between 10,000 and 12,000 ft. Altogether 8 nests were found; they were very similar to those of *M. vulgaris*. The nest was usually built in a juniper but on 2 occasions in a hollow in a cliff. The song seems to lack the quality and variety of that of the Blackbird but was not often heard. The call and also the alarm note resembles *tchut-ut-ut* rapidly repeated. The rattling alarm so freely used by the latter was only heard when the eggs or young were in danger. The males were very wary and were seldom seen near the nest except when there were young. The majority appear to breed in immature plumage, only 2 were observed in the glossy black dress with orange bill of the adult.]

[672.] MERULA CASTANEA. The Grey-headed Ousel.

Rattray, J. B. N. H. S. xvi. p. 657 (abundant in the Murree Hills). Ward, op. cit. xvii. p. 482 (occurs in Kashmir in varying numbers).

598. ♀ ad. Kohat, 1,760 ft., 18th February.

657. ♂ ad. Hangu, 2,600 ft., 8th March.

Fairly common from November till April in the wooded nullahs of the Samana in company with flocks of *M. atrigularis*. A few individuals occur in the Miranzai Valley and in the orchards of Kohat in February and March.

I met with a family-party on the 9th of August on the Safed Koh at 8,000 feet.

[674.] MERULA FUSCATA. The Dusky Thrush.

Major Magrath shot a specimen of this Thrush on the 7th of April in his garden at Bannu; the skin is now in the British Museum. On seeing it I

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was struck by its resemblance to one which Capt. Keen shot for me at Kohat the previous winter (22nd March, 1906), about which I made the following notes at the time: "Differs from *H. atrigularis* in the throat and cheeks being light brown tinged with red, turning to blackish on the upper breast." Unfortunately I had no time to skin it.

Major Magrath has sent me the following extract from his pocket-book made near Kohat and dated April 6th, 1905:—"A Thrush, upper parts like *M. atrigularis*, abdomen and vent white; the throat I could not see; a *broad buff supercilium*." So it seems probable that it is also a winter visitor to Kohat. Oates records it as a rare winter visitor to North-eastern India only.

[677.] MERULA ATRIGULARIS. The Black-throated Ousel.

Marshall, J. B. N. H. S. xiv. p. 603 (very common); Fulton, op. cit. xvi. p. 51 (one shot in April); Ward, op. cit. xvii. p. 482 (abundant in winter).

578. ♂ ad. Kohat Pass, 3,000 ft., 12th February.

These birds are abundant on the Samana and in the Miranzai Valley from October to the middle of April, but their further movements towards the plains depend a good deal on the weather. In the severe winter of 1904-05 Major Magrath noted them at Kohat in large numbers as early as December, but in the following year, which was mild, we did not observe them till February, and then only a few.

Not met with in the Kurram Valley.

[691.] PETROPHILA CINCLORHYNCHA. The Blue-headed Rock-Thrush.

Fulton, J. B. N. H. S. xvi. p. 51 (shot one in May: Chitral); Rattray, t. c. p. 657 (nests freely round Murree); Ward, op. cit. xvii. p. 482 (plentiful, in Kashmir).

A rare cold-weather visitor to the District from September till May. A few nests on the Safed Koh.

[693.] PETROPHILA CYANUS. The Western Blue Rock-Thrush.

Marshall, J. B. N. H. S. xiv. p. 603 (a fairly common summer visitor); Fulton, op. cit. xvi. p. 51 (a summer visitor, not common); Rattray, t. c. p. 657 (rare: Murree Hills); Ward, op. cit. xvii. p. 482 (occurs in summer).

A rather scarce winter visitor from October till mid-April, keeping almost entirely to low rocky hills and generally seen singly or in pairs. Breeds on the Samana and in the Kurram Valley from 5,000 to 12,000 feet.

[694.] MONTICOLA SAXATILIS. The Rock-Thrush.

Marshall, J. B. N. H. S. xiv. p. 603 (one in January and one in April); Fulton, op. cit. xvi. p. 52 (shot two in autumn); Ward, op. cit. xvii. p. 482 (occurs in Baltistan in summer).

I have only once met with this species, and that was on the 6th of September in a stony valley near Kohat, when the autumn migration was at its height. I got a good view of it through my glasses, but unfortunately did not secure it.

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[695.] TURDUS VISCIVORUS. The Missel-Thrush.

Marshall, J. B. N. H. S. xiv. p. 604, & xv. p. 355 (a resident in the hills round Quetta); Fulton, op. cit. xvi. p. 52 (resident in Chitral); Ward, op. cit. xviii. p. 482 (resident and common).

In the severe weather of January 1905, Major Magrath observed one in an orchard at Kohat, and Mr. Donald's bird-catchers caught two on the grass-farm about the same time. None have been seen there since.

In the Kurram Valley it nests not uncommonly amongst the firs and Deodars of the Peiwar spur, and in the Spin Khwar Nullah from 7,000 to 9,000 feet.

[697.] TURDUS ILIACUS. The Redwing-Thrush.

Mr. Oates writes (Fauna Brit. Ind., Birds, ii. p. 156):—"I have not been able to examine any specimen of Redwing obtained in India, and I admit the species on the authority of Jerdon, who states that at the time he wrote it had been lately found in the Himalayas, though very rarely. But at Kohat," he adds, "as I am assured by Mr. Blyth, according to a very good observer, the late Lieut. Trotter, it is a regular winter visitant in large flock." Major Magrath and I have looked in vain for this species for the last three winters. Possibly the flocks of Calandra Larks (*Melanocoryphla bimaculata*) were mistaken for Redwings.

[709.] CINCLUS ASIATICUS. The Brown Dipper.

Fulton, J. B. N. H. S. xvi. p. 52 (not uncommon from 4,000 to 10,000 ft.); Ward, op. cit. xvii. p. 482 (very common in Kashmir).

Occurs along the larger streams of the Safed Koh up to 9,000 feet, but is scarce. I shot a strong flying young bird on the 27th of June.

[712.] ACCENTOR RUFILATUS. The Red-sided Accentor.

Accentor rufilatus Sharpe, Cat. Birds B. M. vii. p. 664 (1882).

Accentor nepalensis (part.) Oates, Faun. Brit. Ind., Birds, ii. p. 166.

Ward, J. B. N. H. S. xvii. p. 482 (occurs in Ladak and Baltistan); Perreau, op. cit. xviii. p. 186 (Chitral).

274. Sex? Samana, 6,500 ft., 5th April.

296. Sex? Safed Koh, 12,300 ft., 1st July.

A rather rare winter visitor to the Samana from the beginning of November till April, generally found singly about cliffs or on steep stony slopes, but never much below 6,000 feet.

Nests freely on the Safed Koh above 12,000 feet. I came across the first nest on the 1st of July 1906; it was placed under a rock on a steep slope and contained three fresh eggs closely resembling those of our Hedge-Sparrow, but larger, averaging ·88″ × ·57″. The nest was beautifully made of grass and roots, lined with moss and a little fur. On the 28th of July I came on two more nests built in crevices in cliffs each containing two young ones, the most noticeable feature about them being their bright red gapes. This is not the first record of the nest. Mr. Stuart Baker writes that he has

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an authenticated clutch of eggs in his collection from Ladakh, taken previously to mine, though he adds that his is that of *A. nepalensis*, as he does not recognise *A. rufilatus* as a good species.

[713.] ACCENTOR HIMALAYANUS. The Altai Accentor.

Ward, J. B. N. H. S. xvii. p. 482 (large flocks pass through Kashmir in spring).

132. ♀ ad. Samana, 6,500 ft., 7th March.

361. Sex ? „ „ 5th April.

A visitor to the Samana from December till the middle of April. Usually to be seen in large flocks, busily feeding amongst stones, near the Fort. Major Magrath procured the first examples of both this and the last species.

[716.] THARRHALEUS ATRIGULARIS. The Black-throated Accentor.

Marshall, J. B. N. H. S. xiv. p. 604 (shot one in January); Fulton, op. cit. xvi. p. 744 (shot two in March); Ward, op. cit. xvii. p. 482 (common in spring).

66. ♀ ad. Kohat, 1,760 ft., 5th January.

A common winter visitor arriving in October and leaving towards the middle of March. It closely resembles the Hedge-Sparrow in habits, but is somewhat gregarious.

[719.] THARRHALEUS JERDONI. Jerdon's Accentor.

Watson, J. B. N. H. S. xv. p. 145 (small flocks occur in January and March: Chaman); Ward, op. cit. xvii. p. 482 (breeds in Kashmir).

407. Ad. Samana, 6,000 ft., 2nd December.

A winter visitor to the Samana (above 4,000 feet) in small numbers; it frequents scrub-jungle, and is generally solitary; it is perhaps commoner than it appears to be, but is such a terrible skulker that one rarely gets more than a glimpse of it.

Nests fairly commonly on the Safed Koh, between 9,000 and 12,000 feet, both in the forest and in Juniper-scrub. The alarm-note resembles the syllable *tir-r-r*.

[722.] PLOCEUS BENGALENSIS. The Black-throated Weaver-bird.

Rattray, J. B. N. H. S. xii. p. 340.

We have not met with this species in Kohat, but Col. Rattray records it from Thall, and writes as follows:—"Appeared suddenly about the beginning of June in all the reed-patches on the river-banks; they fly about in flocks of twenty or thirty birds. On 25th June 1898, I found a nest containing three eggs much incubated . . . ."

Mr. Donald, the Political Officer, observed a flock in the reeds near Thall in March. Probably a resident species, moving locally up and down the river.

[734.] UROLONCHA MALABARICA. The White-throated Munia.

Rattray, J. B. N. H. S. xii. p. 340 (not common); Fulton, op. cit. xvi.

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p. 52 (summer visitor up to 4,000 ft.: Chitral); Ward, op. cit. xvii., p. 483 (occurs in Kashmir).

A resident in the plains; abundant in summer, but becoming scarce in winter.

[758.] SPORÆGINTHUS AMANDAVA. The Indian Red Munia.

Rattray, J. B. N. H. S. xii., p. 340; Ward, op. cit. xvii., p. 483 (occurs in Jammu).

Colonel Rattray met with a few flocks of this species on the jheels (marshes) and amongst high grass near Thall. Mr. Donald, the Political Officer, who passes through Thall monthly on tour, tells me that he has observed flocks in the reeds there at all seasons, and in August has seen parents going about with newly-fledged families.

[740.] COCCOTHRAUSTES HUMII. Hume's Hawfinch.

Fulton, J. B. N. H. S. xvi., p. 52 (shot 2 in May at 4,000 ft.: Chitral).

50. ♂ ad. Raisan 2,360 ft., 25th December.

85. ♂ ad. Kohat, 1,760 ft., 14th January.

638. ♂ ad. Hangu, 2,700 ft., 3rd March.

A winter visitor in fair numbers from October till mid-April, being especially common in the Miranzai Valley, but rare on the Samana. It generally occurs in small parties about wild olive-groves, orchards, and gardens, feeding on berries, seeds, and the kernels of fruit-stones. The call-note, which is frequently uttered, is a shrill *tee*, not at all what might be expected from such a big bird.

I met with a party of five on the 5th of May at 9,000 feet on the Peiwar Spur; possibly the bird nests about there.

[741.] PYCNORHAMPHUS ICTEROIDES. The Black-and-Yellow Grosbeak.

Rattray, J. B. N. H. S. xvi. p. 657 (common: Murree Hills); Ward, op. cit. xvii. p. 484 (abundant); Perreau, op. cit. xviii. p. 186 (Chitral).

671, 672. ♂ ♂ ad. Hangu, 2,700 ft., 12th March.

A common bird on the wooded slopes of the Safed Koh from 7,000 to 11,000 feet, but shy, and its loud call-note, *préter-pre*, is more often heard than the bird seen. A few occasionally descend to the Miranzai Valley in winter.

[743.] PYCNORHAMPHUS CARNEIPES. The White-winged Grosbeak.

Marshall, J. B. N. H. S. xiv. p. 604 (common in the hills round Quetta) Ward, op. cit. xvii. p. 486, & xviii. p. 462 (resident, but scarce).

301. ♂ ad. Safed Koh, 8,500 ft., 7th July.

Not nearly so common as the last species, but much bolder and less of a forest-bird, keeping more to the Juniper-scrub between 8,000 and 12,000 feet. Frequently to be seen perched in some prominent position, uttering its familar notes *wil-ye-go-ame* or *croak-et-et*. The flight is whirring and dipping like that of a Woodpecker. I found a nest containing two hard-set eggs on the 7th of July. It was beautifully made of twigs and bents, well lined with fresh strips of Juniper-bark. The eggs were of the Hawfinch

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type, of a French-white colour with strong reddish-brown markings, and averaged 1·18″ × ·72″.

[754.] PROPASSER DUBIUS (Prjev.). The White-browed Rose-Finch.

Fulton, J. B. N. H. S. xvi. p. 52 (April, 9,000 ft.: Chitral); Ward, op. cit. xvii. p. 484, & xviii. p. 463 (common in spring, breeding in August near source of Sind River).

288. ♀. Safed Koh, 10,000 ft., 29th June.

Not uncommon on the Safed Koh in summer from 8,000 to 11,000 feet. Apparently an early breeder. I came on a family very strong on the wing on the 29th of June. Its loud call *pwit, pwit* may be constantly heard, recalling somewhat the Paroquet's (*Palæornis*) screech, especially when a party wing their way overhead and all call together.

[757.] PROPASSER GRANDIS. The Red-mantled Rose-Finch.

Marshall, J. B. N. H. S. xiv. p. 604 (9,000 ft. in May); Fulton, op. cit. xvi. p. 744 (fairly common in spring from 7,000 to 9,000 ft.); Ward, op. cit. xvii. p. 484 (Kashmir).

133. ♂ ad. Chikarkot, 2,000 ft., 2nd March.

628. ♀ ad. Kohat, 1,850 ft., 1st March.

649. ♂ ad. Hangu, 2,700 ft., 6th March.

A winter visitor in small numbers to the Miranzai and Kohat Valleys. It is usually met with singly or in small parties about wild olive and camel-thorn (*Acacia machata*) groves, gardens, and cultivated spots, feeding on various tree seeds, dandelion-flowers, &c. Call-note, *wir*. It was also observed on several occasions on the Safed Koh in July between 10,000 and 11,000 feet.

Tame and confiding in its habits.

[761.] CARPODACUS ERYTHRINUS. The Common Rose-Finch.

Marshall, J. B. N. H. S. xiv. p. 604 (Quetta: common at 9,000 ft. in May); Fulton, op. cit. xvi. p. 52 (common from 10,000 to 15,000 ft. in July, and at 5,000 ft. in winter); Ward, op. cit. xvii. p. 484 (found everywhere).

179. ♂ ad. Kohat, 1,760 ft., 3rd April.

Major Magrath has made the following notes on this species:—"Visits the district in considerable numbers on the spring and autumn migrations, passing through on the former in March and April, and on the latter in September and October, when mostly young birds are seen. A good deal of damage is done by this species to the fruit-trees, which it attacks by eating the buds after the manner of Bullfinches. The song may be rendered thus, *to-weet-tew*."

In the summer I found the bird abundant in several of the valleys of the Safed Koh from 6,500 to 8,500 feet, where in the early morning the loud though rather monotonous song resounds on all sides.

[763.] ERYTHROSPIZA GITHAGINEA. The Desert-Finch.

Perreau, J. B. N. H. S. xviii. p. 186 (one shot: Chitral).

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88. ♂ ad. Kohat, 1,760 ft., 18th January 1906.

This example was procured by Major Magrath out of a small flock at the foot of the hills. Subsequently I frequently met with the birds, generally feeding on stony ground, but once in young crops. They are probably resident. I came across a pair near Thall on the 19th of May which, I believe, had a nest, but failed to find it.

[764B.] RHODOSPIZA OBSOLETA. The Persian Desert-Bullfinch.

Watson, J. B. N. H. S. xv. p. 145 (common in gardens in August and September and again in March: Chaman, 4,450 ft., near Quetta).

74. ♂ ad. Kohat, 1,760 ft., 8th January.

Oates (Fauna Brit. Ind., Birds, ii. p. 233) wrote that this species was likely to be found within Indian limits. Capt. Watson procured, I believe, the first authenticated examples in India, at Chaman. Subsequently Capt. Marshall and Major Betham found it common round Quetta, and the latter discovered a number of nests (*vide* Rep. of Baluchistan Nat. Hist. Soc. in J. B. N. H. S. xviii. p. 521). From the 8th of January till the 1st March 1906, a flock frequented a Mohamedan cemetery near Kohat which was much over-grown with weeds, on the seeds of which they used to feed. The males had started singing by the 1st of March; the call-note may be rendered *worr*.

[767.] CARDUELIS CANICEPS. The Himalayan Goldfinch.

Marshall, J. B. N. H. S. xiv. p. 604 (Quetta: scarce); Fulton, op. cit. xvi. p. 53 (very common in summer up to 13,000 ft.); Ward, op. cit. xvii. p. 484 (the majority migrate through Kashmir, but a few stay to nest).

625, 626. ♀ ♀ ad. Kohat, 1,760 ft., 29th February.

A winter visitor, occurring in large flocks from November till the middle of April. Its confiding habits are taken advantage of by the local bird-catchers, who snare large numbers, retailing them at 2*d*. or 3*d*. each.

One of the commonest birds on the Samana in winter. Capt. Keen tells me that a few stayed there all through the summer, and he believes nested in the neighbourhood.

We also observed a few in the Upper Kurram Valley in spring and summer.

[768.] CALLACANTHIS BURTONI. The Red-browed Finch.

Fulton, J. B. N. H. S. xvi. p. 53 (Chitral: summer visitor); Ward, op. cit. xvii. p. 484, & xviii. p. 463 (nests in Kashmir).

Not uncommon on the Safed Koh in summer between 8,000 and 9,000 feet. Its loud whistling call-note—*chew-ee*—is very striking. It is usually uttered from high up on a bare branch.

Colonel Ward describes a nest taken from a fir-tree at 9,000 feet as being very small and made of pine-needles; the eggs measured ·88″×65″, and whereof a greenish blue marked with dark brown spots at the larger end.

[771.] METOPONIA PUSILLA. The Gold-fronted Finch.

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Marshall, J. B. N. H. S. xiv. p. 604 (Quetta: common on passage); Fulton, op. cit. xvi. p. 54 (resident in Chitral: nest at 12,000 ft. in July in birch-scrub); Ward, op. cit. xvii. p. 484, & xviii. p. 463 (breeds in Kashmir and Baltistan).

414. ♂ ad. Samana, 5,600 ft., 13th December.

A rather rare winter visitor to the Samana, occurring in small parties, and sometimes in flocks of forty or fifty, from December till April. The flocks may be easily located by their incessant twittering (which resembles the syllables *bri-i*).

Fairly common in summer between 8,000 and 9,000 feet on the Peiwar Spur.

[772.] HYPACANTHIS SPINOIDES. The Himalayan Greenfinch.

Rattray, J. B. N. H. S. xvi. p. 658 (nests fairly common in the Murree Hills); Ward, op. cit. xvii. p. 484 (Kashmir: common up to 8,000 ft.).

409. Juv. Samana, 6,500 ft., 6th December.

A few individuals are to be found in December and January in company with the flocks of Goldfinches on the Samana near Fort Lockhart, but the bird is not at all common.

[774.] FRINGILLA MONTIFRINGILLA. The Brambling.

Ward, J. B. N. H. S. xvii. p. 484 (passes through); Perreau, op. cit. xviii. p. 186 (one shot in Chitral).

134. ♀ ad. Hangu, 2,700 ft., 3rd March.

Migrates through the District in small numbers early in March, associating with big flocks of Buntings. Not observed on the autumn passage.

FRINGILLA CŒLEBS. The Chaffinch.

135. ♀ ad. Hangu, 2,700 ft., 3rd March.

I came across a pair of this species in an orchard near Hangu in March 1906 and secured one specimen. The following February I saw what I feel certain was another (a male), but in the excitement of the moment I missed it and never saw it again.

[775.] GYMNORHIS FLAVICOLLIS. The Yellow-throated Sparrow.

Rattray, J. B. N. H. S. xii. p. 340 (Thall: rather rare).

777. ♂ ad. Kohat, 1,760 ft., 2nd April.

A common summer visitor to the District, arriving about the 1st of April. It usually breeds in trees, but the demand for nesting-sites seems to be greater than the supply, one nest that I found being built after the fashion of that of *Passer domesticus*, and placed conspicuously in the top of a thorn-bush. It contained four fresh eggs. I shot the hen on her return, to make quite sure of her identity.

[776.] PASSER DOMESTICUS. The House-Sparrow.

Rattray, J. B. N. H. S. xii. p. 340 (common); Marshall, op. cit. xiv. p. 604 (Quetta: very common, but in summer only); Fulton, op. cit. xvi. p. 54 (summer visitor only); Ward, op. cit. xvii. p. 485.

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791. ♂ ad. Kohat, 1760 ft., 16th March.

755. ♂ ad. „ „ 27th „

Major Magrath writes of this species in Kohat as follows :—"The usual pest and only too common. In April and early in May vast flocks of a migratory race of this species pass through the District in company with the next and the flocks of *Pastor roseus* already mentioned. Numbers of them are slaughtered along with the two latter. Does not winter on the Samana."

The above two examples belong to a melanistic variety not uncommon round Kohat.

[778.] PASSER HISPANIOLENSIS. The Spanish Sparrow.

Watson, J. B. N. H. S. xv. p. 145 (large flocks from October till December: Chaman); Fulton, op. cit. xvi. p. 54 (passes through Chitral in April and October); Ward, op. cit. xvii. p. 485 (met with in July).

676. ♂ ad. Thall, 2,550 ft., 14th March.

I will again quote from Major Magrath's excellent notes :—"Mixed up with flocks of the last species, numbers of the present occur on the spring migration. At the height of the migration vast flocks of Sparrows in company with flocks of *Pastor roseus* pour into the station at sundown to roost. The combined noise of these birds before they have settled down to sleep is indescribable, and the smell of them becomes quite appeciable and rather offensive. Gardens, hedges, and trees are disgustingly soiled by the rain of their excreta. Shooting the birds is encouraged in Cantonments at this time, and every sepoy who can procure a gun slaughters to his heart's content. But notwithstanding these drastic measures little mitigation of the nuisance is effected."

The spring migration sets in about the second week in March and continues till the middle of May, the return passage commencing early in August and continuing till October, but comparatively few are seen in autumn. A few stay the winter, being fairly common then in the reed-beds and scrub round Lachi. None appear to breed in the Kurram Valley, but a large number pass through.

An example picked up by Major Magrath near Peiwar (6,500 feet) had evidently been strangled by getting its head inextricably fixed between the primaries when preening itself.

[779.] PASSER MONTANUS. The Tree-Sparrow.

Rattray, J. B. N. H. S. xii. p. 340 (nests freely: Upper Kurram); Marshall, op. cit. xiv. p. 604 (a very common resident: Quetta); Fulton, op. cit. xvi., p. 54 (a common resident: Chitral); Cumming, t. c. p. 688 (abundant in April: Seistan); Ward, op. cit. xvii., p. 485.

714. ♂ ad. Kohat, 1,850 ft., 20th March.

Common in winter in the Miranzai Valley, a few individuals occurring as low as Kohat and Banda. Mr. Donald found a nest with young in Doaba

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Station (3,000 feet) in May and says that the bird nests regularly at Shinauri (3,800 feet). It possibly also does so at Thall (2,550 feet), where I observed a solitary example on the 18th of May. In the Upper Kurram this species and *P. domesticus* are present in about equal numbers in summer, and build alongside one another in houses; but the former, as noted by Capt. Fulton in his paper on "The Birds of Chitral," get the pick of the nesting-sites before the latter's arrival, and in many cases *P. domesticus* has to put up with holes in cliffs.

[782.] PETRONIA STULTA. The Rock-Sparrow.

Ward, J. B. N. H. S. xvii. p. 485 (winter visitor to Gilgit).

599. Ad. Banda, 2,000 ft., 19th February.

Major Magrath first met with a flock of this species in February 1906 feeding in a stubble near Kohat. It is apparently a regular winter visitor, more common in the desolate country south of Banda than elsewhere. I found it very wary and generally feeding in young crops in flocks of fifteen or twenty.

[785.] MONTIFRINGILLA ADAMSI, Moore. Adams's Mountain-Finch.

[I came on a small flock of Mountain-Finches on the 2nd of August on a grassy knoll at an altitude of 10,000 feet in the Safed Koh. From their markings and colouring I attribute them to this species, but they were rather wild and I did not secure one, and do not therefore feel justified in entering the species on the list.]

[787.] FRINGILLAUDA SORDIDA. Stoliczka's Mountain-Finch.

Fulton, J. B. N. H. S. xvi., p. 55 (common in summer from 10,000 to 14,000 ft.); Ward, op. cit. xvii. p. 485 (breeds in Kashmir).

136. Ad. Samana, 6,500 ft., 7th March.

642, 645. ♂ ♂ ad. Samana, 6,500 ft., 5th March.

243, 644. Ad. Samana, 6,500 ft., 5th March.

During the intense cold in March 1906, when the snow was lying deep round Fort Lockhart, Major Magrath noticed small flocks of these birds picking up scraps round the cook-house door and shot one. They left when the snow melted. The following winter I was stationed there, but did not meet with a single specimen. In March 1908, however, I spent a couple of days there and found large flocks feeding on fallow land; curiously enough, the weather was comparatively warm then and there was no snow lying.

[789.] EMBERIZA SCHŒNICLUS. The Reed-Bunting.

Watson, J. B. N. H. S. xv. p. 145 (December: Chaman); Ward, op. cit. xvii. p. 485, & xviii., p. 463 (Gilgit and near Srinagar).

126. Sex? Kohat, 1,760 ft., 20th February.

593. Sex? " " 17th "

Fairly common from November to March in reed-beds and irrigated crops and on the grass-farm, or occasionally in dry stubble and scrub-jungle. Varies much in size and colouration.

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[792.] EMBERIZA LEUCOCEPHALA. The Pine-Bunting.

Marshall, J. B. N. H. S. xiv., p. 604 (common in winter); Ward, op. cit. xvii., p. 485 (occurs in early spring); Perreau, op. cit. xviii., p. 186 (specimen shot: Chitral).

52. ♀ ad. Raisan, 2,300 ft., 25th December.

103. ♂ ad. Kohat, 1,700 ft., 5th February.

640. ♂ ad. Hangu, 2,700 ft., 3rd March.

A winter visitor, occurring in small flocks from December till March about cultivated places, often in company with *E. stracheyi*.

[793.] EMBERIZA STEWARTI. The White-capped Bunting.

Marshall, J. B. N. H. S. xiv., p. 604 (Quetta: common in summer); Fulton, op. cit. xvi., p. 55 (Chitral: very common from 5,000 to 12,000 ft.); Rattray t. c. p. 672 (Murree Hills: common); Betham, t. c. p. 832 (nests round Quetta); Ward, op. cit. xvii. p. 485 (rare).

648. ♂ ad. Darband, 2,800 ft., 6th March.

725. ♂ ad. Kohat, 1,760 ft., 22nd „

778. ♂ ad. Kachai, 2,700 ft., 1st April.

A common resident on the Samana and in the Kurram Valley, nesting up to 10,000 feet. In winter it is found in varying numbers throughout Kohat above 3,000 feet, wherever there is a good supply of grass and other seeds. During cold spells, however, and on migration large numbers appear in the plains, but they keep chiefly to scrub-jungle, olive-groves, and rocky valleys, avoiding cultivation.

[794.] EMBERIZA STRACHEYI. The Eastern Meadow-Bunting.

Watson, J. B. N. H. S. xv. p. 145 (one shot in November: Chaman); Fulton, op. cit. xvi., p. 55 (abundant from 4,000 to 14,000 ft., according to season); Rattray, t. c. p. 672 (nests freely in the Murree Hills); Ward, op. cit. xvii., p. 485 (resident: Kashmir).

53. ♀. Raisan, 2,300 ft., 25th December.

60. ♀. Kohat, 1,760 ft., 2nd January.

124. ♀. „ „ 19th February.

A winter visitor to Kohat and by far our commonest Bunting from the second week in October till April, occurring at all elevations and on all sorts of ground, though more commonly about cultivated places than elsewhere. On the Samana it quite takes the place of *Passer domesticus* in winter. It nests fairly commonly on the Safed Koh up to 11,000 feet.

[795.] EMBERIZA BUCHANANI. The Grey-necked Bunting.

Marshall, J. B. N. H. S. xiv., p. 604 (common in April near Quetta); Ward op. cit. xvii. p. 485 (a rare spring migrant); Perreau, op. cit. xviii., p. 186 (Chitral).

Not an uncommon species on the spring passage from the middle of April to the middle of May. It frequents stony ground covered with patches of scrub, usually singly or in pairs. On the autumn migration I only observed

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it once, *viz.*, on the 16th of September. An example was forwarded from Bannu to the British Museum by Major Magrath.

[800.] EMBERIZA LUTEOLA. The Red-headed Bunting.

Marshall, J. B. N. H. S. xiv. p. 604 (a few seen in May in Chitral); Fulton op. cit. xvi., p. 744 (a spring migrant).

534. ♂. Kurram Valley, 6,800 ft., 27th April.

Passes through the District and up the Kurram Valley in force from mid-April till mid-May, returning in August and September. Major Wardlaw-Ramsay found this species nesting in the Hariob Valley, which drains into the Kurram Valley just west of our limits.

[802.] EMBERIZA STRIOLATA. The Striolated Bunting.

Marshall, J. B. N. H. S. xiv., p. 604 (not rare in summer: Quetta).

Rare. I met with a party of six or seven in some very desolate country between Lachi and Dhand on the 23rd of February 1907 and shot one bird which corresponded well with Oates's description.

[804.] CHELIDON URBICA. The House-Martin.

Rattray, J. B. N. H. S. xii., p. 340 (Thall: rare); Marshall, op. cit. xiv., p. 604 (Quetta: May); Ward, op. cit. xvii., p. 483 (breeds in Ladak).

Colonel Rattray shot a specimen at Thall on the 14th of May 1898, out of a small flock. We have seen one or two flocks of what appeared to be this species, on spring migration, but have never shot an example.

[805.] CHELIDON KASHMIRENSIS. The Kashmir Martin.

Fulton, J. B. N. H. S. xvi., p. 55 (Chitral: common in summer); Rattray, t. c. p. 659 (common in the Galis, nesting freely in verandahs: Murree Hills); Ward, op. cit. xvii. p. 483 (breeds in Kashmir).

Fairly numerous in summer along the Safed Koh Range, nesting either singly or in small colonies under overhanging crags from 6,000 to 8,000 feet. The nest resembles that of the last species, but varies considerably in size and shape according to the situation.

[808.] COTILE RIPARIA. the Sand-Martin.

Fulton, J. B. N. H. S. xvi., p. 55 (Chitral: common in summer); Ward, op. cit. xvii. p. 483 (Kashmir).

The large Sand-Martin which migrates through Kohat in April and May must, I think, be of this species, though I have not shot an example. Major Magrath shot one out of a large flock on the autumn passage at Bannu, just south of our limits.

[808A.] COTILE DILUTA. The Pale Sand-Martin.

Sharpe and Wyatt, Monogr.—Hirundinidæ, p. 63.

437. ♀ ad. Khushalgarh, 1,200 ft., 16th February.

679. ad. Thall, 2,550 ft., 14th March.

This species is distinguished from *C. riparia* by its paler colour, smaller size, and less sharply defined pectoral band.

It is probably widely distributed in India, but owing to its resemblance

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to the last-named species, has been overlooked. In Kohat it is common enough and resident, large colonies nesting in the banks of the Indus and Kurram Rivers in February and March. The specimen, shot at Thall in March, was one of a breeding-colony. Major Magrath also found a large colony in March, nesting in the banks of the Kurram River (south of our limits), and secured two typical examples.

Besides these there are five specimens in the British Museum, *viz.*, a doubtful one obtained by Jerdon at Madras, two from Afghanistan, and two from Central Asia.

[809.] COTILE SINENSIS. A resident species in the District.

[810.] PTYONOPROGNE RUPESTRIS. The Crag-Martin.

Marshall, J. B. N. H. S. xiv. p. 604 (nests freely round Quetta); Fulton op. cit. xvi. p. 55 (Chitral: summer visitor, found up to 13,000 ft.); Rattray, t. c. p. 659 (nests in the Murree Hills); Ward, op. cit. xvii. p. 483 (nests in Ladak).

277. Ad. Samana, 6,500 ft., 12th April.

A winter visitor from October till April. Probably resident on the Samana. Nests fairly common in the precipices of the Safed Koh.

[812.] PTYONOPROGNE OBSOLETA. The Pale Sand-Martin Major Magrath shot an example out of a flock at Bannu in December 1907 and I found it quite common in the precipitous hills of southern Kohat in March. A few were then in pairs so perhaps it nests there.

[813.] HIRUNDO RUSTICA. The Swallow.

Rattray, J. B. N. H. S. xii. p. 341 (Murree Hills: a common resident); Marshall, op. cit. xiv. p. 605 (abundant in summer: Quetta); Cumming, op. cit. xvi. p. 688 (Seistan, 1,700 ft.: summer visitor); Ward, op. cit. xvii. p. 483 (summer visitor: Kashmir); Perreau, op. cit. xviii. p. 186 (Chitral).

A fairly common resident in the Miranzai Valley, nesting freely at Thall (2,550 ft.) and at Doaba, but becoming scarce in winter and temporarily disappearing in severe weather. A summer visitor to the Kurram Valley in small numbers.

Major Magrath has found this highly migratory species to be resident even in the hot plains of Bannu (1,200 ft.) (*vide* 'Field,' March 28th, 1908).

[818.] HIRUNDO SMITHI. The Wire-tailed Swallow.

Rattray, J. B. N. H. S. xii. p. 341 (common); Ward, op. cit. xvii. p. 483 (summer visitor: Kashmir).

A summer visitor and abundant from April till October, the first birds arriving in the middle of March.

Occurs in the Kurram Valley up to 6,000 feet, but only in small numbers.

[822.] HIRUNDO NEPALENSIS. Hodgson's Striated Swallow.

Marshall, J. B. N. H. S. xiv. p. 605 (summer visitor: Quetta); Rattray, op. cit. xvi. p. 659 (nests freely in the Galis).

Numbers pass up the Miranzai Valley in the first half of April. I shot an

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example at Hangu on the 9th, and found a retort-shaped nest under a bridge close by, though whether it belonged to this species or the next I did not discover, as I was only passing through.

[823.] HIRUNDO ERYTHROPYGIA. Sykes's Striated Swallow.

Rattray, J. B. N. H. S. xii. p. 341 (great numbers passed through Thall in the middle of May).

A small party of these Swallows arrived on the Samana towards the end of March 1907. On the 4th of April I shot one, its beak and forehead were plastered with mud; it had evidently started nesting-operations.

[826.] MOTACILLA ALBA. The White Wagtail.

Marshall, J. B. N. H. S. xiv. p. 605 (Quetta: common in winter); Fulton op. cit. xvi. p. 55 (Chitral: resident from 4,000 to 10,000 ft., according to season); Ward, op. cit. xvii. p. 723 (rare in Kashmir).

Large numbers arrive in Kohat early in September, and a few stay through the winter; the majority pass on and return about the middle of February, again to disappear towards the middle of May.

[829.] MOTACILLA PERSONATA. The Masked Wagtail.

Watson, J. B. N. H. S. xv. p. 145 (fairly common in winter: Chaman, 4,450 ft.); Fulton, op. cit. xvi. p. 56 (Chitral: resident from 6,000 to 12,000 ft., according to season); Cumming, t. c. p. 688 (Seistan: April); Ward, op. cit. xvii. p. 723 (breeds from 6,000 to 8,000 ft.).

First arrivals at Kohat noted in the last week of August. Many remain through the winter. Leaves about the same time as the preceding. Nests commonly along the Kurram River from Thall (2,550 ft.) upwards.

[831.] MOTACILLA MADERASPATENSIS. The Large Pied Wagtail.

Rattray, J. B. N. H. S. xii. p. 341 (Thall: common, many stay to nest) Ward, op. cit. xvii. p. 723 (Kashmir).

A resident in Kohat, but scarce. A few pairs were noted along the Siau Nullah and the Kohat Toi.

[832.] MOTACILLA MELANOPE. The Grey Wagtail.

Rattray, J. B. N. H. S. xii. p. 341 (Thall: rare); Marshall, op. cit. xiv. p. 605 (Quetta: a few seen at 7,000 ft. in May); Fulton, op. cit. xvi. p. 56 (Chitral: March); Cumming, t. c. p. 688 (Seistan: very common); Ward, op. cit. xvii. p. 723 (common, and breeds in Kashmir).

A familiar cold-weather visitor, arriving in the plains towards the end of August. Nests freely along the streams of the Safed Koh from 6,000 to 8,000 feet.

[833.] MOTACILLA BOREALIS. The Grey-headed Wagtail.

Marshall, J. B. N. H. S. xiv. p. 605 (Quetta: a few seen in April); Cumming, op. cit. xvi. p. 688 (common; Seistan): Ward, op. cit. xvii. p. 723 (Kashmir).

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760. ♂ ad. Kohat, 1,760 ft., 29th March.
771. ♂. " " 31st March.
782. ♂ ad. Kohat, 1,760 ft.. 3rd April.

Occurs on passage from March till mid-May, but not so commonly as the next species.

[835.] MOTACILLA BEEMA. The Indian Blue-headed Wagtail.

Fulton, J. B. N. H. S. xvi. p. 56 (common in April); Ward, op. cit. xvii. p. 723 (breeds in Ladak).

770. ♂ ad. Kohat, 1,760 ft., 31st March.
783. ♂ ad. " " 3rd April.
68. ♂ ad. " " 17th April.

Passes through Kohat in fair numbers from the second week in March till nearly the end of May, being very common in April; the return passage lasts from August till well into October.

[836.] MOTACILLA FELDEGGI. The Black-headed Wagtail.

Marshall, J. B. N. H. S. xiv. p. 605 (Quetta: fairly common in April); Cumming, op. cit. xvi. p. 688 (common in Seistan in April); Ward, op. cit. xvii. p. 723 (migrates through Kashmir).

768. ♂ ad. Kohat, 1,760 ft., 31st March.
769. Juv. " " "

Small numbers appear towards the end of March and early in April, in company with the last species.

[837.] MOTACILLA CITREOLA. The Yellow-headed Wagtail.

Ward, J. B. N. H. S. xvii. p. 723 (common on migration: a few nest in Kashmir).

727. ♂ ad. Kohat, 1,760 ft., 23rd March.

Occurs fairly commonly from February till nearly the end of May. This species and the next are more usually to be found about marshes than the preceding, and commonly roost in reed-beds, when available. None were seen in autumn.

[838.] MOTACILLA CITREOLOIDES. Hodgson's Yellow-headed Wagtail.

Fulton, J. B. N. H. S. xvi. p. 56 (Chitral: saw a pair at 10,000 ft. in July); Ward, op. cit. xvii. p. 723 (breeds in Kashmir).

775. ♂. Kohat, 1,760 ft., 2nd April.

The same may be said of this species as of the last, but it is rather more common.

It may be of interest to add that this year (May and June 1909) I found this species nesting freely from 8,800 to 13,000 feet in the Kaghan Valley (Hazara, N. W. Frontier), north of our limits.

Oates says of *M. citreola*, "the young probably assume the *adult plumage at the first spring mout*"; and of the present species, "the young do not appear to differ *in any respect* from those of *M. citreola*." This, however, appears not to be the case for I came across a number of nests and only about

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half of those breeding were in full plumage. The remainder were of two forms :—

(1) Grey above, with black feathers here and there; supercilium and under surface yellowish-white.

(2) Dark grey above with some black feathers; head and under surface deep yellow, sullied on the flanks and crown.

I have sent two examples, namely a nesting pair, the male of type (2) and the female of type (1), to the British Museum.

[840.] ANTHUS TRIVIALIS. The Tree-Pipit.

Marshall, J. B. N. H. S. xiv. p. 605 (common near Quetta in winter); Fulton, op. cit. xvi. p. 56 (a few resident between 5,000 and 10,000 feet); Betham, t. c. p. 832 (found two nests near Quetta in June).

712. ♀ ad. Kohat, 1,760 ft., 19th March.

Large numbers pass through Kohat and the Kurram Valley from mid-March till mid-May, returning in August, September, and October, but comparatively few halting.

[840A.] ANTHUS PRATENSIS. The Meadow-Pipit.

708. ♀ ad. Kohat, 1,760 ft., 19th March.

Major Magrath was the first to meet with this species in N. W. India, and in January and February 1908 secured four examples at Bannu. I only met with one at Kohat, but possibly it has been overlooked, owing to its resemblance to *A. trivialis*.

[844.] ANTHUS SIMILIS. The Brown Rock-Pipit.

Marshall, J. B. N. H. S. xiv. p. 605 (summer visitor); Ward, op. cit. xvii. p. 723 (occurs: Kashmir); Perreau, op. cit. xviii. p. 186 (specimen shot: Chitral).

566. ♂. Kohat, 1,760 ft., 6th February.
569. ♂. " " 8th February.
736. ♂ ad. " " 24th March.
743. ♂ ad. " " 27th March.

A common resident in the District, nesting on the Samana in summer, and occurring from August till April along the foot of the hills and on stony ground generally. From January till the end of March it is also found commonly about cultivated lands. It perches readily in trees. It varies a good deal in size and colour. In February 1908 there were flocks of peculiarly dusky individuals on the grass-farm. Nos. 566 and 569 are examples of this dark-coloured Pipit.

[845.] ANTHUS RICHARDI. Richard's Pipit.

61. ♀ ad. Kohat, 1,760 ft., 4th January.
582. ♂ ad. " " 14th February.

A rare winter visitor, these being the only examples met with. Both were procured on the grass-farm.

[847.] ANTHUS RUFULUS. The Indian Pipit.

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Rattray, J. B. N. H. S. xii. p. 341 (Thall: common in winter); Ward, op. cit. xvii. p. 723.

140. ♀ ad. Kohat, 1,760 ft., 11th March.
145. ♀ ad. „ „ 15th March.
151. ♂ ad. „ „ 17th March.

A summer visitor, arriving early in March and breeding in numbers on the grass-farm and other suitable places. Colonel Rattray must, I think, have mistaken *A. campestris* (which I have shot at Thall) for this species.

[848.] ANTHUS CAMPESTRIS. The Tawny Pipit.

Marshall, J. B. N. H. S. xiv. p. 605 (Quetta: winter visitor).

69. ♀ ad. Kohat, 1,760 ft., 7th January.
142. ♂ ad. „ „ 13th March.
485. ♀ ad. Thall, 2,500 ft., 14th April.
492. ♂ ad. „ „ 16th April.

Fairly numerous from the middle of September till the middle of April, chiefly frequenting dry open country, and not found much about cultivated ground. Not observed on the Samana or in the Kurram Valley.

[850.] ANTHUS ROSACEUS. Hodgson's Pipit.

Ward, J. B. N. H. S. xvii. p. 723 (breeds freely in Kashmir).

298. ♂. Safed Koh, 12,000 ft., 2nd July.
486. ♂ ad. Thall, 2,550 ft., 14th April.
586. Juv. Kohat, 1,850 ft., 15th February.

Flocks composed chiefly of immature birds visit the District from January till mid-April, frequenting, for the most part, marshes and irrigated land. This species nests freely on the Safed Koh, from 11,000 to 13,000 feet. I found two nests in June, both under stones, perfectly concealed, and well and solidly constructed of roots and grass. In one case I surprised the bird excavating the hollow under a stone for the nest. Not noted in autumn.

ANTHUS SPIPOLETTA CLAKISTONI (Hartert Vog. Pal. Fauna I. p. 228.) The Central Asian Water-Pipit.

387. ♀. Samana, 28th October 1906.
568. ♂ juv. Kohat, 1,760 ft., 7th February.
622. ♂ ad. „ „ 29th February.
632. ♂ ad. „ „ 1st March.
636. ♂ ad. „ „ 2nd March.
646, 647. ♂ ♀ ad. Samana, 6,500 ft., 5th March.

A winter visitor, and by far our commonest Pipit from early in October till about the 18th of March. It moults into the beautiful summer plumage before leaving. A few individuals are to be found on the dry rocky summit of the Samana all the winter. No. 568 is a dusky specimen.

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[852.] ANTHUS JAPONICUS. The Eastern Water-Pipit.

84. ♂. Kohat, 1,760 ft., 14th January.
155. ♂. „ „ 22nd March.
184. ♂. „ „ 4th April.
581. ? sex. „ „ 14th February.

A somewhat scarce winter visitor, occurring singly, with the flocks of *A. spipoletta blakistoni*, or in small parties by itself.

[853.] OREOCORYS SYLVANUS. The Upland Pipit.

Rattray, J. B. N. H. S. xvi. p. 654 (common in the Murree Hills); Ward, op. cit. xvii. p. 723.

398. ♂ ad. Samana, 4500 ft., 14th November.

A resident on the Samana from 4,000 feet upwards, but not common.

[859.] MELANOCORYPHA BIMACULATA. The Eastern Calandra Lark.

Fulton, J. B. N. H. S. xvi. p. 56 (plentiful in Chitral at the end of February and beginning of March); Ward, op. cit. xvii. p. 724 (one shot in December).

Large flocks visit Kohat in February and early in March.

[860.] ALAUDA ARVENSIS. The Sky-Lark.

Marshall, J. B. N. H. S. xiv. p. 605 (common round Quetta in winter, a few stay for the summer); Fulton, op. cit. xvi. p. 56 (a resident between 5,000 and 11,000 feet); Ward, op. cit. xvii. p. 724 (a resident).

577. ♂ ad. Jamrud, 2,000 ft., 11th February.
615. ♀ ad. Lachi, 1,540 ft., 26th February.
704. ♀ ad. Kohat, 1,760 ft., 18th March.
737. ♀ ad. „ „ 25th March.

A winter visitor, abundant from November till March. By the end of the latter month it is entirely replaced by the next species, which arrives in the second week in March.

[861.] ALAUDA GULGULA. The Indian Sky-Lark.

Ward, J. B. N. H. S. xvii. p. 724 (reported from the Jammu plains).

695. ♂. Lachi, 1,540 ft., 17th March.
728. ♂. Kohat, 1,760 ft., 23rd March.
752. ♂. „ „ 27th March.

A summer visitor, nesting freely on the grass-farm. It can be distinguished from *A. arvensis* by the harsh note uttered on rising and by the song which is not so rich as that of the latter.

862. CALANDRELLA BRACHYDACTYLA. The Short-toed Lark.

Marshall, J. B. N. H. S. xiv. p. 605 (abundant from winter till May 1st); Fulton, op. cit. xvi. p. 56 (Chitral: many pass through in October).

Occurs commonly in Kohat and the Kurram Valley from the last week in February till the middle of April (last seen on the 19th), and returns in small numbers in September.

[864.] CALANADRELLA TIBETANA.—

613. ♀. Lachi, 1,540 ft., 26th February.

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621. ♂. Kohat, 1,760 ft., 29th February.

730, 731. ♀ ♂. Kohat, 1,760 ft., 23rd March.

Major Magrath shot an example of this species at Bannu in December 1907. It has now been found to occur in Kohat and is fairly common in spring.

[869.] MIRAFRA CANTILLANS. The Singing Bush-Lark.

266. ♂ ad. Kohat, 1,760 ft., 19th May.

Fairly numerous from the middle of May till September about grassy and bushy places. Not observed in the Kurram Valley, though fairly common at Thall at the entrance. A most energetic songster; many of its notes seem to be borrowed from *Argya caudata*.

[874.] GALERITA CRISTATA. The Crested Lark.

Rattray, J. B. N. H. S. xii. p. 341 (very common at Thall); Marshall, op. cit. xiv. p. 605 (Quetta: a very common resident); Cumming, op. cit. xvi. p. 689 (Seistan: abundant); Perreau, op. cit. xviii. p. 186 (Chitral).

610. ♀. Lachi, 1,540 ft., 26th February.

687. ♀. Kohat, 1,760 ft., 16th March.

723. ♀. „ „ 21st March.

754. ♂. „ „ 27th March.

This species is abundant everywhere and resident up to 3,000 feet. In the Kurram Valley it occurs up to 7,000 feet in summer. It is a great mimic, as Major Magrath has noted, its rendering of the notes of *Sarcogrammus indicus* and *Totanus calidris* being particularly good.

[878.] AMMOMANES PHŒNICUROIDES. The Desert Finch-Lark.

Rattray, J. B. N. H. S. xii. p. 341 (Thall: rather rare); Marshall, op. cit. xiv. p. 605 (Quetta: common in the low hills); Cumming, op. cit. xvi. p. 689 (fairly common in Seistan); Ward, op. cit. xvii. p. 724 (Kashmir).

609. ♂. Lachi, 1,540 ft., 25th February.

761. ♀. Kohat, 1,850 ft., 30th March.

Resident and abundant on stony waste sand hill-sides up to 3000 feet.

The song reminds one somewhat of that of *Anthus similis*, being often uttered on the wing.

[879.] PYRRHULAUDA GRISEA. The Ashy-crowned Finch-Lark.

196. ♀ ad. Kohat, 1,760 ft., 8th April.

The above example was one of the only pair met with. The male, a fine black-breasted bird, I failed to secure.

[895.] ARACHNECHTHRA ASIATICA. The purple Sun-bird.

Rattray, J. B. N. H. S. xii. p. 341 (Thall: common in summer).

A common summer visitor, arriving in the middle of March, the males about a week ahead of females and disappearing towards the middle of September. It occurs up to 5,000 feet on the Samana.

(*To be continued.*)

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PLANTS OF THE PUNJAB.

A BRIEF DESCRIPTIVE KEY TO THE FLORA OF THE PUNJAB, NORTH-WEST FRONTIER PROVINCE AND KASHMIR.

BY

Lieut.-Colonel C. J. BAMBER, F.L.S.,

Indian Medical Service.

PART VI.

(Continued from page 502 of Volume XX.)

HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

Antirrhinum Orontium, Corn Snap Dragon.
SCROPHULARIACEÆ.
F. B. I. iv. 253.
The Plains to 6,000 ft.
Simla in fields (Collett).
Dharmpur (Bomford).
Kahuta (Douie).

small, annual or biennial, slender smooth below, glandular above, branched from below; leaves opposite below, alternate above, ½ in., linear, rarely oblong lanceolate; flowers pale pink, with purple streaks, ½ in. long, solitary and sessile in the axils of the upper leaves, calyx lobes 5, linear, overtopping the corolla, corolla ½ in. long, flattened, bulged at the base, 2-lipped, upper erect, 2-lobed, lower lip horizontal, 3-lobed, base broad, bearded, closing the throat, which is forced open by bees, stamens 4 in unequal pairs, within the corolla, style threadlike, stigma 2-lobed; capsule ½ in. long, ovoid, velvety, 2-celled, many seeded, anterior cell opening by one pore, posterior by two toothed pores, or both cells by one pore, seeds minute, oblong, abruptly ended, wrinkled or pitted.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

Mimulus gracilis,
Monkey Flower,
SCROPHULARIACEÆ.
F. B. I. iv. 259.
The Plains to 3,000 ft.
Kashmir.
Hazara.
Rawalpindi (Douie).

small, annual, stem stout, 4-angled, branching from the base; leaves 1½-2½ in. linear oblong, sessile, half stem-clasping, rather fleshy, blunt, sometimes slightly toothed; flowers ½ in. long, white or pale blue, spotted with yellow, solitary on axillary stalks, longer than the leaves, calyx ⅓ in. long, tubular, 5 short lobes, 5-keeled, corolla ½ in. long, tube cylindric, 2-lipped, upper lip erect, 2-lobed, lower lip horizontal, 3-lobed, throat with two ridges, stamens 4, in unequal pairs within the corolla, style slender, stigma 2-lobed, flat; capsule less than ⅓ in. ovoid with one end broader, flattened, opening by valves, enclosed in the calyx, seeds many, minute, oblong.

Herpestis,
Hamiltoniana,
SCROPHULARIACEÆ.
F. B. I. iv. 272.
The Plains to 3,000 ft.

small, annual, smooth, stem very stout, much branched; leaves ½-1 in., linear-lanceolate, sometimes slightly toothed, often minutely dotted; nerves barely visible, short-pointed; flowers blue, minute, sessile in the axils of the leaves, calyx ⅙ in., lobes 5, unequal, upper ovate heart-shaped, corolla tube ⅙ in., cylindric, lips 2 spreading, upper notched or 2-lobed, lower 3-lobed, stamens 4, in unequal pairs within the corolla, anthers close together, style linear dilated at the top, stigma 2-lobed; capsule round, 2-grooved, opening by 2 or 4 valves, seeds many, very minute.

Vandellia crustacea,
SCROPHULACEÆ.
F. B. I. iv. 279.
The Plains to 3,000 ft.
Sutlej Valley (Collett).

small, annual, found in marshes, much and widely branched from the root in threes, smooth or slightly hairy; leaves ½-1 in., sometimes toothed, ovate or lanceolate, shortly stalked; flowers ½ in. long, pale purple, solitary on axillary straight slender stalks, ½-1½ in. long or crowded towards the ends of

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

branches, calyx $\frac{1}{10}$ in. and in fruit $\frac{1}{6}$ in., shortly 5-lobed, longer than the capsule, nearly bell-shaped, not angled, corolla 2-lipped, upper lip erect notched, lower broader, horizontal, 3-lobed, stamens 4, in unequal pairs, 2 anterior longer with curved filaments spurred near the base, 2 posterior, usually included, anthers touching or joining in pairs under the upper lip, style curved, stigma flat 2-lobed; capsule shorter than the calyx, oblong-ovate, blunt, opening through the lines of junction, seeds wrinkled.

Vandellia erecta, SCROPHULARIACEÆ. F. B. I. iv. 281. The Plains.

very like the last species, but smaller, and more erect, quite smooth, leaves sessile oblong with rounded ends, flower stalks twice as long as the leaves, calyx lobes shorter than the rounded ovoid capsule.

Ilysanthes parviflora, SCROPHULARIACEÆ. F. B. I. iv. 283. The Plains.

small, annual, usually much branched, found in marshes; leaves $\frac{1}{4}$-1 in., ovate with ends rounded or linear oblong, sessile, usually untoothed; flowers $\frac{1}{6}$-$\frac{1}{4}$ in. long, white or blue, on threadlike stalks $\frac{1}{4}$-$\frac{1}{2}$ in. long in the axils of leaves or at the end of branches in racemes, calyx half the length of the corolla, lobes narrowly lanceolate, corolla 2-lipped, $\frac{1}{6}$-$\frac{1}{4}$ in. tube cylindric, upper lip erect, concave, notched, lower larger, spreading, 3 lobed, stamens 4, two upper perfect, enclosed in the corolla, filaments threadlike, anthers meeting, two lower, two lobed, one lobe glandular, the other smooth, style single, stigma round consisting of two plates; capsule ovate, oblong, short-pointed, longer than the calyx.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

Striga lutea, SCROPHULARIACEÆ. F. B. I. iv. 298. The Plains to 6,000 ft. Valleys below Simla (Collett). Dharmpur (Bomford).

small, annual, rough or hairy, slender, branched or not, leaves $\frac{1}{2}$-$1\frac{1}{2}$ in. long, linear, sessile, upper alternate sometimes reduced to floral bracts; flowers yellow, sometimes white, scarlet or purple, $\frac{1}{2}$ in. long, sessile, solitary, axillary forming terminal spikes, calyx tubular, ten, rarely fifteen ribbed, 5-toothed, corolla variable in size, tube slender, twice as long as the calyx, bent in at the top, two lipped, upper lip usually short notched or deeply cut, lower divided into three, stamens 4 in unequal pairs, within the corolla, anthers one-celled, vertical, fixed at the back portion of the stamen behind the anther, sometimes pointed, style thickened above, stigma undivided; capsule nearly round, splitting through the cells, seeds very many, netted.

Striga euphrasioides, SCROPHULARIACEÆ. F. B. I. iv. 299. The Plains to 4,000 ft. Chakwal (Douie).

small, slender to stout, branched, rough or covered with stiff hairs; leaves $\frac{1}{4}$-2 in., often 1 to 2-toothed, linear; flowers $\frac{1}{2}$-$\frac{3}{4}$ in. long, white at distant intervals in a terminal spike, calyx $\frac{1}{4}$ in., 15-ribbed, lobes as long as the tube, bell or funnel-shaped in fruit, corolla $\frac{1}{2}$-$\frac{3}{4}$ in., tube velvety at the bend; otherwise like the last species.

Sesamum indicum,

see Herbs, Erect, Opposite, Exstipulate, Simple, Toothed, Corolla Two-lipped, Stamens Four.

Hygrophila salicifolia, ACANTHACEÆ. F. B. I. iv. 407. The Plains.

small to medium size, found in wet places, nearly smooth; leaves $2\frac{1}{2}$ by $\frac{1}{2}$-$\frac{2}{3}$ in., lanceolate, smooth, nearly sessile, narrowed at both ends, marked in lines by raphides; flowers $\frac{1}{2}$-$\frac{2}{3}$ in., pale purple, sessile in bractate and bracteolate axillary circles, bracts $\frac{1}{4}$-$\frac{1}{3}$, ovate or oblong, round at the end, bracteoles $\frac{1}{6}$-$\frac{1}{4}$ in., lanceolate, short pointed, half as long

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

as the calyx, calyx $\frac{1}{3}$-$\frac{1}{2}$ in., divided half way down in flower, all the way down in fruit, lobes 5, linear, covered with bristly hairs, corolla tube dilated near the mouth, 2-lipped, upper lip erect, concave, notched or 2-lobed, lower broad, 3 lobed, stamens 4, in equal or unequal pairs, style long, hairy, stigma linear, undivided ; capsule $\frac{1}{2}$-$\frac{2}{3}$ in., narrowly oblong, 20-28 seeded, seeds ovoid, flattened, white-hairs spring up when wetted.

Hygrophila spinosa, *Talmakhana gokula kanta, gokshura.*
ACANTHACEÆ.
F. B. I. iv. 408.
The Plains to 3,000 ft.

medium size to large, found in wet places, stout, hairy, stems in clusters ; leaves 3-7 in. long, lanceolate or oblong-lanceolate, pointed at both ends, nearly sessile, covered with scattered white hairs ; flowers 1 in. long, pale blue or purple to white in large dense hairy axillary clustered circles with 6 straight stout spines $\frac{1}{2}$-$1\frac{1}{2}$ in., bracts $\frac{1}{2}$-1 in., lanceolate, bracteoles $\frac{1}{4}$-$\frac{1}{3}$ in., narrow, calyx 4-lobed, lobes $\frac{1}{3}$-$\frac{1}{2}$ in. lanceolate, upper one largest, lower blunt, toothed or divided into two, corolla 1 in. long, upper lip 2 lobed, stamens as in the last species ; capsule $\frac{1}{2}$ in., shorter than the calyx, 4-8 seeded.

Lepidagathis purpuricaulis,
ACANTHACEÆ.
F. B. I. iv. 519.
The Plains.
Hoshiarpur (Aitchison).

small to medium size, leafy, branches many, smooth or hairy, often purple ; leaves 1-5 in., lanceolate or ovate-lanceolate, sometimes in unequal pairs, larger narrowed at both ends, smooth, smaller, nearly ovate, somewhat velvety ; flowers $\frac{1}{4}$ in., white with brown spots at the base of the lower lip, sessile, in axillary sessile solitary or clustered oblong hairy spikes, $\frac{1}{2}$-$1\frac{1}{2}$ in. long, bracts $\frac{1}{3}$ by $\frac{1}{6}$ in., marked with longitudinal lines, lanceolate or ovate lanceo ate with a bristle point, bracteoles $\frac{1}{4}$ in., linear curved, calyx nearly divided to the

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

base into 5 segments, one segment large, $\frac{1}{3}$-$\frac{1}{2}$ by $\frac{1}{5}$ in. broad, the others $\frac{1}{3}$ in. linear, corolla $\frac{1}{4}$ in., tubular, suddenly dilated in the middle, 2-lipped, upper lip erect, notched, lower 3-lobed, longer, stamens 4, in unequal pairs, anthers 2-celled, cells oblong blunt, stigma round; capsule $\frac{1}{5}$ in., 4-seeded, oblong, seeds flattened, hairs rise upon being wetted.

Lepidagathis hyalina,
ACANTHACEÆ.
F. B. I. iv. 521.
The Plains to 4,000 ft.

medium size, perennial; leaves 3 by $1\frac{1}{2}$ in., ovate or oblong, stalked, upper narrow, hanging down, stalk $\frac{1}{2}$ in.; flowers white with brown spots at the base of the lower lip, crowded in oblong or ovoid, one-sided, terminal or axillary spikes $\frac{1}{2}$-$1\frac{1}{2}$ in. long, bracts nearly $\frac{1}{2}$ in., lanceolate long-pointed with an abrupt point, bracteoles $\frac{1}{3}$ in., linear-lanceolate with an abrupt point, calyx nearly divided to the base in 5 segments, segments linear lanceolate, $\frac{1}{3}$ in. with scattered hairs, outer segment larger, corolla, stamens, style capsule and seeds as in last species.

Ocimum basilicum,
Sweet basil,
Furunj, mushk, tulsi, baburi, niyazbo, panr.
LABIATÆ.
F. B. I. iv. 608.
The Plains to 2,000 ft.
Cultivated, but indigenous in the low hills (Aitchison).
Baluchistan (Hughes-Buller).

medium size, strongly scented, many oil glands, smooth or velvety; leaves $1\frac{1}{2}$-2 in., ovate, sometimes toothed, stalk very slender, usually slightly hairy; flowers $\frac{1}{3}$-$\frac{1}{2}$ in. long, in clustered circles, 6-10 flowered, in bracteate spikes and racemes, bracts stalked, ovate, minute, soon falling off, calyx 5-toothed, upper tooth rounded, shorter than the others, two lower teeth ovate-lanceolate with a bristle point, two lateral shorter than the lower; corolla $\frac{1}{3}$-$\frac{1}{2}$ in. long, white, pink or purplish, 2-lipped, tube short, upper lip nearly equally 4-lobed, lower lip curved down, not lobed, stamens 4, protruding, twice as long as the corolla, bent, hairy at the bend, stigma bifid; nutlets 4, $\frac{1}{16}$ in. each, very black;

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

oblong with rounded ends, minutely dotted, convex on one side and flattened on the other, when wetted become coated with mucilage. These seeds form one of the ingredients of Char tukm, a preparation well-known to native druggists. They are used as a demulcent in genito-urinary diseases. The dried leaves are used as a substitute for cloves, and as a seasoning for culinary purposes.

Ocimum sanctum,
Sacred basil.
Kala tulsi, ban tulsi.
LABIATÆ.
F. B. I. iv. 609.
The Plains to 6,000 ft.
Baluchistan (Boissier).

medium size, perennial, cultivated, doubtfully indigenous, often woody below, much branched, bushy, often with a purplish tinge; leaves 1-2½ in., oblong, blunt or sharp pointed, sometimes almost toothed, base narrowed, floral leaves sessile, ovate lanceolate or heart-shaped; flowers very small, white, pink or purplish on small stalks in very slender bracteate racemes, bracts as in the last species, calyx short, two lower teeth with very long bristle points, longer than the upper which is broadly oblong, lateral broadly ovate, shorter than the lower, corolla scarcely extending beyond the calyx, calyx in fruit ⅙ in. long, on a slender stalk, widely bell-shaped, thin, nutlets nearly round, nearly smooth, pale reddish brown; other characters are like the last species. The leaves and seeds are used for the same purposes as the last species. It is worshipped by the Hindus and a plant is to be found in every Hindu's garden.

INNER PAIR OF STAMENS LONGEST.

Nepeta linearis, see Herbs, Prostrate, Opposite, Exstipulate, Simple.

Nepeta connata, see Herbs, Prostrate, Opposite, Exstipulate, Simple.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR LONGEST.

Origanum vulgare, Wild marjoram.
Mirzanjosh, sathra.
LABIATÆ.
F. B. I. iv. 648.
Himalaya, 7-12,000 ft.
Simla (Collett).

medium size, scented, covered with hairs to some extent; leaves ½-1 in., broadly ovate, stalked, sometimes toothed; flowers very small, pink, crowded in many 4-sided spikes ¼-1 in. long, in clusters or heads at the end of branches or forming terminal branching racemes, floral leaves like bracts lanceolate, longer than the calyx, overlapping often tinged with purple; calyx bell-shaped, 5-toothed, 10-13 nerved, throat hairy, corolla barely 2-lipped, upper lip erect, nearly flat, notch lower spreading, 3-lobed, stamens 4, in unequal pairs, just protruding, style divided; nutlets 4, smooth. This plant is used as a pot herb, it yields a volatile oil which is aromatic and stimulant.

Thymus serpyllum,

see Shrubs, Opposite, Exstipulate, Simple Corolla Two-lipped.

Hyssopus officinalis,

see Shrubs, Opposite, Exstipulate, Simple, Corolla Two-lipped.

Micromeria biflora and hydaspidis,

see Shrubs, Opposite, Exstipulate, Simple Corolla Two-lipped.

Calamintha clinopodium, Wild basil.
LABIATÆ.
F. B. I. iv. 650.
Himalaya, 4-12,000 ft.
Simla, Mashobra (Collett).
Changlagalli (Douie).

medium size, rootstock woody, stems slender, nearly unbranched, hairy; leaves 1-2 in., ovate, just pointed, hardly toothed; flowers ⅔-1 in., purple or pink in large crowded compact circular clusters each surrounded by many long, linear, hairy bracts, equal in length to the calyx, calyx ⅓ in., 2 lipped, curved, hairy, 13-nerved, upper lip 3-toothed, lower bifid, teeth nearly equal, very slender,

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR LONGEST.

corolla hairy, tube straight, 2-lipped, upper lip erect, flattish, lower spreading, 3-lobed, stamens 4, in unequal pairs under the upper lip, style lobes equal; nutlets 4, minute, nearly round, smooth.

Brunella vulgaris,
Self-heal,
Aústakhadús.
LABIATÆ.
F. B. I. iv. 670.
Himalaya, 4-11,000 ft.
Simla, common on road sides (Collett).
Kashmir.
Murree (Douie).

small, perennial, rootstock creeping, stem erect or partially so, thinly hairy; leaves 1-2 in., stalked, ovate or oblong, sometimes toothed, pointed or blunt, upper leaves sessile; flowers $\frac{1}{2}$-$\frac{3}{4}$ in. long, violet purple, rarely white, in clustered circles of 6 crowded in erect, terminal spikes 1-2 in. long, with a pair of sessile leaves at the base; floral leaves bract-like hairy, purple-edged, broadly ovate, short pointed; calyx tinged with purple, bell-shaped, 2-lipped, upper lip broad, 3-toothed, lower lip deeply bifid, mouth closed after flowering, corolla tube longer than the calyx, 2-lipped, upper lip erect; hoodlike, notched, lower spreading, 3-lobed, midlobe largest, minutely toothed, stamens 4 in unequal pairs under the upper lip, with a small projection below the anthers, style lobes awl-shaped; nutlets 4, oblong, smooth. The plant is used in Native medicine as an expectorant and antispasmodic.

Stachys parviflora,

see Herbs, Opposite, Exstipulate, Simple, Toothed.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS UNITED.

COROLLA TWO-LIPPED

STAMENS FOUR.

OUTER PAIR LONGEST.

Leucas hyssopifolia,
LABIATÆ.
F. B. I. iv. 690.
The Plains at the foot of the Himalaya, to 3,000 ft.
Valleys below Simla (Collett).

small, perennial, hairy, rootstock stout, woody branches many; leaves 1-2½ by ¼ in., linear, blunt, often stiff, margins turned in; flowers ¾ in. long, white in small axillary and terminal circular clusters, ½-¾ in. diam., bracts few, slender, awl-shaped, calyx ¼ in., an inverted cone, smooth, mouth wide, abruptly cut off, smooth, teeth 10, very minute, erect, corolla tube cylindric, within the calyx, 2-lipped, upper lip erect, hood-like, very hairy, lower much longer, 3-lobed, mid lobe the largest not toothed, stamens 4, in unequal pairs, under the upper lip, outer or anterior pair longer, style awl shaped, undivided; nutlets 4, ovoid, blunt, three-cornered.

Leucas aspera,
Chota-hal-kúsa.
LABIATÆ.
F. B. I. iv. 690.
The Plains.

small, annual, stem stout hairy or bristly, much branched; leaves 1-3 in. linear or oblong, sometimes larger and ⅔ in. broad, also minutely toothed; flowers ⅔-1 in. white in terminal and axillary clustered circles, often 1 in. diam., hairy, bracts long linear and thread like, calyx ⅓-⅔ in., tubular, curved, smooth below, green, rough, ribbed above, teeth 10, short, triangular, upper lip produced; corolla, stamens, style and nutlets as in the last species. The plant is fragrant and used as a pot herb, and in chronic skin diseases and painful swellings the juice is useful.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

Silene apetala,
CARYOPHYLLACEÆ.
F. B. I. i. 218.
The Plains.
Peshawar (Vicary, Stewart).

medium size, stem branched or not, annual, grey velvety; leaves 1-1½ in., linear oblong, long-pointed; flowers ¼-⅓ in., long, green (as the petals, if present, are enclosed within the green calyx), in irregular clusters in one-sided racemes, bracts sharp pointed, calyx ¼-⅓ in., bell-shaped base, a reversed cone with 5 short teeth, and 10 green hairy ridges, petals none or if any, minute, red, stamens 10, styles 3 (rarely 5); capsule round, shortly stalked, 3-6 valved, seeds flat grooved with a double corrugated margin.

Ammania pentandra,
LYTHRACEÆ.
F. B. I. ii. 568.
The Plains, in moist places.

small, annual, smooth, much branched with many flowers; leaves 1 in. long, oblong with rounded ends, sessile, floral leaves bract like, oblong, broad based; flowers small, solitary, sessile in the axils of leaves, bracteoles awl-shaped as long as the calyx, calyx teeth 10, 5 of which are accessory, lanceolate long pointed, petals, if any, pink, 5, stamens 8, inserted about the middle of the calyx tube, style thread like or short; capsule round, depressed, 3-celled, seeds many black, half round, hollowed on the flat side.

Ammania baccifera,
Dadmari, pampa.
LYTHRACEÆ.
F. B. I. ii. 569.
The Plains, in moist places.

small, annual, rarely large, smooth; leaves 2-5 in. long, narrow, but blunt pointed, narrow at the base; flowers small in dense clusters forming knots on the stem, bracts thread like, shorter than the flower stalks, calyx widely bell-shaped, teeth 4, broadly triangular, accessory folds or teeth very small, petals none, or very minute, stamens and style as in the last species, capsule like the last, but opening all round, about the middle, seeds like the last. The leaves are used for blistering.

Ammania salicifolia,
LYTHRACEÆ.
F. B. I. ii. 569.
The Plains.

medium size, annual, smooth, branched; leaves 2 by ½ in., lanceolate, rounded at the base, sessile; other characters like the last species.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

Ammania senegalensis, LYTHRACEÆ. F. B. I. ii. 570. The Plains to 5,000 ft. Common in rice fields. — medium size, annual, smooth branches 4-angled; leaves 1-2 in. long, lanceolate, sessile, nearly ear-lobed at the base; flowers minute in small shortly stalked clusters, calyx bell-shaped, 4 short teeth, petals, if any, 4, pink, stamens 6 or 8, capsule—$\frac{1}{12}$ in. diam., round, larger than the calyx tube, red when ripe, seeds as in the last species.

Ammania multiflora, LYTHRACEÆ. F. B. I. ii. 570. The Plains. — very like the last species, but the flowers and capsule are smaller.

Oxybaphus himalaicus, *Punac, bhans.* NYCTAGINACEÆ. F. B. I. iv. 708. Himalaya, 6-9,000 ft. Kulu (Edgeworth). — large, glandular hairy, sticky, branched; leaves $1\frac{1}{2}$-$2\frac{1}{2}$ in. ovate, short pointed leaf, stalk $\frac{1}{2}$-1 in. long; flowers pink, small, solitary on long slender axillary stalks forming a loose cluster, one bract forming a 5-toothed cup, $\frac{1}{4}$ in. long, surrounding the calyx, calyx pink, tube short lobed, lobes soon falling off, stamens 4, united below, enclosed within the calyx tube; fruit $\frac{1}{8}$ in. long, ovoid, rough black. This plant is used for fodder.

Bœrhaavia elegans, *Sant.* NYCTAGINACEÆ. F. B. I. iv. 709. The Plains. Kahuta (Douie). Baluchistan. — large, shrubby, much branched, leaves 1-$1\frac{1}{2}$ in. long, few, linear oblong or oblong lanceolate, blunt, fleshy with a hoar frostlike bloom; flowers minute, in very large two or three times divided clusters on very long slender main and minor stalks, calyx funnel-shaped, 5-lobed, petals none, stamens 1-5, projecting; fruit $\frac{1}{10}$ in. long, narrowly oblong with rounded ends, strongly ribbed, quite smooth. The seeds are eaten. The leaves are used as a diuretic.

Cyathula tomentosa, AMARANTACEÆ. F. B. I. iv. 722. Himalaya, 2-6,500 ft. Simla (Collett). — large, felted or woolly, branches nearly 4-angled; leaves 2-10 in. long, oblong, pointed at both ends rarely round, shortly stalked, $\frac{1}{4}$-$\frac{1}{2}$ in.; flowers white shining in small clusters crowded in round heads forming terminal spikes, each cluster

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

containing one or two perfect flowers and many imperfect ones consisting of hooked sepals, spikes 2-6 in. long, stalked, calyx 5-fid, segments narrowly lanceolate, 2 or all ending in hooked extremities, lengthening with age, stamens 5, alternate with 5 fringed staminodes united below, style slender, stigma rounded; fruit dry, bladder shaped, 2-nerved, seed one, ovate shining.

Cyathula capitata,
AMARANTACEÆ.
F. B. I. iv. 722.
Himalaya, 6-9,000 ft.
Simla (Collett.)

very like the last, only more slender and flowers collected in heads about one inch in diam.

Pupalia lappacea,
AMARANTACEÆ.
F. B. I. iv. 724.
The Plains to 3,000 ft.
Baluchistan.

large, straggling, felted, branches rounded; leaves 2-4 in., broadly ovate to lanceolate and short pointed, base sharp pointed, leaf stalk $\frac{1}{4}$-$\frac{1}{2}$ in.; flowers in small distant or adjacent clusters $\frac{1}{4}$ in. diam., calyx of 5 sepals, green, 3-nerved, densely woolly, reduced in imperfect flowers to a process, bearing stellately spreading hooked bristles, petals none, stamens 5, nearly free below, staminodes none, style slender, stigma roundish, fruit ovoid, flattened, seed one.

Kothosærua brachiata
AMARANTACEÆ.
F. B. I. iv. 726.
The Plains.

medium size, annual, branched from the base, branches slightly velvety, spreading; leaves 1-2 in. ovate, blunt or short pointed, thin, green, stalk 0-$\frac{1}{4}$ in.; flowers very minute, woolly, in axillary solitary or clustered little spikes, $\frac{1}{4}$-$\frac{1}{2}$ in. long, white, calyx of 3-5 thin, colourless sepals $\frac{1}{30}$ in. long, silky, one nerved, petals none, stamens 1-2, ununited, staminodes none, stigma nearly sessile; fruit minute, oblong, flattened, seed one.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS ENTIRE.

PETALS NONE.

Achyranthes aspera, The Prickly Chaff Flower. *Latjira, chichra, kutri.* AMARANTACEÆ. F. B. I. iv. 730. The Plains to 7,000 ft. Simla (Collett). Rawalpindi. Baluchistan (Boissier).

large, straggling, branched or not, branches long and rambling; leaves 3-5 by 2-3 in., ovate or round, thick, leathery, velvety or felted, shortly stalked; flowers shining, dull green or purplish, soon bending down, crowded in long rigid terminal unbranched spikes, 6-18 in. long, bracts and bracteoles somewhat spiny, calyx $\frac{1}{6}$-$\frac{1}{4}$ in. long, 5-fid, segments stiff, lanceolate, short pointed, longer than the bracteoles, petals none, stamens 5, alternating and united below with 5 fringed staminodes, style long, stigma rounded; fruit oblong enclosed in the calyx, seed one oblong. This plant is used as a diuretic, the ash contains much potash.

Achyranthes bidentata, AMARANTACEÆ. F. B. I. iv. 730. Himalaya, 4-6,000 ft. Simla (Collett).

very much like the last species, but much larger, leaves long pointed with a slender tip, bracteoles usually reduced to a spine, and staminodes toothed, not fringed.

Atriplex hortensis, Atriplex crassifolia,

see Herbs, Alternate, Exstipulate, Simple.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

Dianthus cachimiricus, CARYOPHYLLACEÆ. F. B. I. i. 214. Kashmir.

small, perennial, stem jointed, much branched from the base, slender, smooth; leaves 1-1$\frac{1}{2}$ in., very narrow, grooved, midrib stout, margin slightly toothed, thickened; flowers terminal, solitary, bracts 4, lanceolate with long slender or leafy points, calyx 5-toothed, 1 in. long, teeth ovate-lanceolate, long-pointed, margins thin, petals 5, long-stalked, smooth, blade $\frac{1}{2}$-$\frac{2}{3}$ by 1 in., margin toothed, stamens 10 and ovary one-celled, all on a long stalk, styles 2; capsule opening by 4 teeth.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

Dianthus Jacquemontii, CARYOPHYLLACEÆ. F. B. I. i. 214. Kashmir.

small, stems many, slender from a woody stock; leaves 1-1½ in., narrow, leathery, flat above, short pointed, radical slightly toothed, stem leaves hardly toothed, with thickened margins; flowers usually solitary, bracts 4, very broad, suddenly contracted into a thickened and blunt point, calyx ¾-1 in., teeth long with sharp stiff points, petals 5, long stalked, blade broad, rather deeply toothed; otherwise like the last species.

Dianthus angulatus, CARYOPHYLLACEÆ. F. B. I. i. 215. Himalaya, 7-13,000 ft.

small, stems many, stiff, much branched, from a stout woody stock; leaves radical, 3-6 in., stem leaves ½-1½ in., linear, short-pointed; flowers pink, solitary, terminal, bracts 4-6, pointed, calyx ½-⅔ in., tubular, long and sharp pointed, petals 5, long-stalked, blade fringed; otherwise like the last species.

Silene inflata, Bladder campion. CARYOPHYLLACEÆ. F. B. I. i. 218. Himalaya, 5-11,000 ft. Simla, Mashobra Narkanda (Collett).

large, greenish blue, jointed, smooth or velvety, perennial; leaves 1-2 in. long, ovate or oblong, stem leaves sessile, margins minutely toothed, short pointed; flowers ½-¾ in. diam., white in drooping many-flowered clusters, bracts thin, dry, calyx ¾ in. long, ovoid, puffed out, base indented, 5-toothed, 10-or 20-veined, teeth broadly triangular, petals 5, stalked, blade deeply 2-lobed with pouch-like enlargement, stamens 10, styles 3; capsule round, opening above by 6 teeth, seeds many, concave in front, convex on the base, with lines of excrescences.

Silence Falconeriana, CARYOPHYLLACEÆ. F. B. I. i. 220. Himalaya, 3-9,000 ft. Simla on grassy slopes (Collett).

large, perennial; stems several from the woody stock, branched, velvety and sticky below; leaves 1½-2½ in., linear lanceolate, narrow, velvety or smooth, minutely toothed; flowers white in loose opposite axillary clusters, flower stalks slender, bracts minute, calyx ½ in. tubular, narrow, teeth short, blunt, petals 5, very narrow stalked, blade blunt without scales, stamens 10, styles 3; capsule ovoid, seeds minute, many, sides flat or convex, back grooved.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNUNITED.

Epilobium angustifolium see Herbs, Erect, Opposite, Exstipulate, Simple, Entire.

Epilobium latifolium, see Herbs, Erect, Opposite, Exstipulate, Simple, Entire.

Epilobium hirsutum,
ONAGRACEÆ.
F. B. I. ii. 583.
The Plains to 7,000 ft.
Kotgarh, Sutlej and Giri Valleys in wet places (Collett).
Shahpur Dist. (Douie).

large, robust, covered with soft white hairs; leaves 1-3 by $\frac{1}{4}$-$\frac{1}{2}$ in., lanceolate stem-clasping, teeth small, sharp; flowers $\frac{1}{2}$ in. long, pink-purple, axillary, forming long or short terminal leafy racemes, calyx tube on the ovary, linear 4-angled, teeth 4, short pointed, falling off after flowering, petals 4, erect or spreading, notched, stamens 8, $\frac{3}{8}$ in. long, alternate ones shorter, stigmas 4, distinct, spreading; capsule 2-3$\frac{1}{2}$ in., hairy, 4-celled, valves 4 splitting and curving down from the seed-bearing column, seeds very many, small, crowned by a tuft of long silky hairs.

Epilobium parviflorum,
ONAGRACEÆ.
F. B. I. ii. 584.
Himalaya, 5-7,000 ft.
Simla, Sutlej Valley (Collett).

very like the last species, but the stigmas do not curve down and the leaves are not stem-clasping.

Epilobium roseum, var. cylindricum, and Dalhousianum,
ONAGRACEÆ.
F. B. I. ii. 584.
Himalaya, 6-10,000 ft.
Simla (Collett).

large, stem round, hairs sometimes in lines, the bases of the leaves sometimes passing down the stem in lines, leaves stalked, linear-lanceolate, capsules long stalked, seeds ovoid with the top broad, flowers $\frac{1}{4}$ in., stigmas combined; in other respects like the previous species.

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Herbs, erect, with Opposite Exstipulate Simple Leaves.

Leaf Margins Toothed.

Petals Ununited.

Circæa lutetiana,
Enchanters,
Nightshade,
Onagraceæ.
F. B. I. ii. 589.
Himalaya, 7-10,000 ft.
Mashobra in woods (Collett).

medium size, perennial, velvety; leaves 2 by 1-1¼ in., ovate lanceolate not transparent, long stalked, narrow to the base, short pointed, widely toothed; flowers ⅓ in. diam., white or pinkish in terminal and lateral racemes, calyx ovoid, 2-lobed, hardly produced above the ovary, lobes reflexed, falling off after flowering, bracts none, petals 2, notched, stamens 2, style thread like, stigma almost 2-lobed; capsule ⅛ in., pear shaped with the broad end uppermost, 2-celled, rough with hooked bristles, seeds one in each cell.

Circæa cordata,
Onagraceæ.
F. B. I. ii. 589.
Himalaya, 7-9,000 ft.
Simla in woods (Collett).
Dalhousie, Chamba (C. B. Clarke).

like the last species, but stouter and more hairy, the leaves are long pointed, capsule ovoid.

Circæa alpina,
Onagraceæ.
F. B. I. ii. 589.
Himalaya, 7-11,000 ft.
Mashobra, Mahasu (Collett).

small, smooth; leaves ½-1 in. across, broadly ovate, blunt or short pointed, thin; capsule hardly hairy, very small, seed one, otherwise like the last species.

Petals United.

Bryophylium calycinum,
Zukm-haiyat,
Crassulaceæ.
F. B. I. ii. 413.
The Plains to 3,000 ft.
Sutlej Valley (Collett).

large, perennial, smooth, stem hollow, sprouts on damp ground from the notches on the margin of leaves; leaves 3-6 in. long, ovate or oblong, fleshy toothed, stalked, blunt, rarely compound with 3 leaflets; flowers reddish green, 2. in. long, drooping cylindric in a large terminal branching raceme, calyx tubular, swollen, green tinged with red and spotted with white, 4-toothed, corolla tubular,

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HERBS, ERECT WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

twice as long as the calyx, green, lobes 4, tinged with red, short pointed, spreading, stamens 8, in two series on the corolla-tube, styles 4; fruit of four carpels, many seeded, enclosed in the persistent calyx and corolla. The leaves applied to wounds. Roxburgh states that the plant was introduced into the Calcutta Botanical Gardens and has spread from there.

Kalanchoë spathulata, *Tatara, rungru, haiza-ka-patti.* CRASSULACEÆ. F. B. I. ii. 414. Himalaya, 1-3,000 ft. Valleys below Simla (Collett).

large, perennial, stout, smooth; leaves 4-8 in. (upper 3-4 in.,) fleshy, toothed, oblong narrowed to the stalk; flowers yellow ¾-1 in. long in a large terminal branched flat topped cluster, calyx 4-lobed, divided nearly to the base, lobes triangular, short pointed, corolla tubular, tube flask-shaped, twice the length of the calyx, lobes 4, spreading, short-pointed, stamens, style and capsule as in the last species. This plant is said to be a cure for cholera, it acts as a strong purge and is poisonous to goats and cattle.

Morina persica, *Bekh-akwar.* DIPSACEÆ. F. B. I. iii. 216. Himalaya, 6-9,000 ft. Simla (Collett). Hazara (Barrett). Baluchistan (Lace).

large, like thistles from the spiny leaves; leaves 6 by 1 in., oblong or linear, sessile, doubly spinous toothed, velvety or smooth; flowers 1½ in. long, pinkish-white, sessile, crowded in the axils of the upper leaves forming a terminal interrupted spike, bracteoles few among the flowers, spinous, also united bracteoles forming a tubular cup (involucel) round the base of the flower, calyx tubular, 2-lipped, notched, corolla 1-1½ in., tube long slender, mouth oblique 5-lobed, stamens 2, fertile, as long as the corolla lobes, style nearly protruding, stigma disc-like; fruit an achene in each flower, enclosed within the persistent involucel, tip free.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

Morina longifolia,
DIPSACEÆ.
F. B. I. iii. 216.
Himalaya, 9-14,000 ft.
Mahasu Theog, Hattu (Collett).

very like the last species, but with larger leaves, flowers more pink, calyx lobes not spinous, and stamens shorter.

Morina coulteriana,
DIPSACEÆ.
F. B. I. iii. 216.
Himalaya, 9-13,000 ft.
Patarnala (Clarke).

very like the last species, but smaller, flowers yellow, leaves singly, not doubly spinous, toothed, calyx lobes spinous.

FLOWERS, MINUTE, IN HEADS.

Scabiosa olivieri,

see Herbs, Erect, Opposite, Exstipulate, Lobed.

Scabiosa Candolliana, Scabious.
DIPSACEÆ,
F. B. I. iii. 219.
Himalaya, 3-5,000 ft.

medium size, rootstock perennial, stems tufted, little branched; leaves $1\frac{1}{2}$ by $\frac{1}{8}$ in., linear, slightly toothed, flowers $\frac{1}{4}$-$\frac{1}{2}$ in. long, purple in terminal half round small heads, $\frac{1}{2}$ in. diam. surrounded by short overlapping ovate bracts, $\frac{1}{8}$-$\frac{1}{6}$ in., calyx mouth with 5 short teeth, barbed, bristles $\frac{1}{3}$ in. long, corolla tubular, 5-toothed or in some expanded into long rays, stamens 4, styles threadlike, stigma round; achenes crowned with the involucel and the persistent calyx bristles.

Scabiosa speciosa,

see Herbs, Erect, Opposite, Exstipulate, Lobed.

Ageratum conyzoides.
COMPOSITÆ.
F. B. I. iii. 243.
The Plains to 5,000 ft.
Sutlej Valley (Collett).

medium size, annual, softly hairy; leaves 3 by $1\frac{1}{2}$ in., lanceolate or ovate, stalked, minutely round-toothed; flower heads many, all the flowers alike, $\frac{1}{4}$ in. diam., in dense rounded clusters, bracts round. the flowers narrow, nearly equal, ribbed, short-pointed in 2 series, flowers tubular, pale blue, calyx (pappus) of 3-5 linear, short pointed, minutely barbed scales, united in a toothed cup-like ring, corolla tube dilated upwards, lobes 5, short, style arms short; achenes $\frac{1}{10}$ in., angled black, sticky.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

FLOWERS, MINUTE, IN HEADS.

Siegesbeckia orientalis, COMPOSITÆ. F. B. I. iii. 303. The Plains to 5,000 ft. Simla (Collett). Murree.

medium size, sticky with crisped hairs, a common weed near cultivation, much branched, often purplish; leaves 1-5 in. long, triangular ovate, deeply toothed, upper leaves almost without teeth, leaf stalks winged, flowers yellow, rarely white, radiate with ray flowers, in heads $\frac{1}{4}$ in. diam., arranged in leafy branching racemes, bracts sticky in 2 rows outer five long, narrow, spreading, inner shorter erect, receptacle flat covered with small concave scales, calyx hairs (pappus) none, outer corollas with rays (ligules) 2 or 3-lobed, inner corollas 3-5 lobed, achenes curved, angled, blunt at the base.

Blainvillea latifolia, or rhomboidea. COMPOSITÆ. F. B. I. iii. 305. The Plains to 5,000 ft. Below Sipi (Collett).

medium size, stiff, much branched, roughly hairy annual; leaves stalked, 2-4 in. long, ovate or ovate lanceolate, hairy on both surfaces, short or long pointed, slightly round toothed, upper leaves sometimes alternate; flowers yellow or white, outer rayed in heads $\frac{1}{3}$-$\frac{1}{2}$ in. diam., terminal at the end of branches or axillary, bracts few in two rows, outer broad, leaf-like, inner passing into scales, receptacle covered with rigid concave scales each holding a flower, pappus of 2-5 unequal bristles joined into a ring, rays of outer flowers 2 or 3-toothed, corolla of inner (disk) flowers 5-toothed; achenes 3-angled, inner ones often flattened.

Schlerocarpus africanus, COMPOSITÆ. F. B. I. iii. 305. The Plains to 5,000 ft. Valleys below Simla in cornfields (Collett).

medium size, annual, roughly hairy, leaves $1\frac{1}{2}$-3 in., ovate, short pointed, toothed, stalked; flowers yellow in sessile or stalked heads in the forks or at the end of branches, heads $\frac{1}{3}$-$\frac{1}{2}$ in. diam., bracts few, leaf-like, outer spreading, receptacle covered with large ribbed scales, rays of outer flowers broad, notched, spreading, corolla of disk flowers 3-5 toothed, pappus (calyx hairs) none; achenes curved, ribbed, enclosed by the rough boat-shaped scales of the receptacle.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

FLOWERS, MINUTE, IN HEADS.

Spilanthes acmella,
Akarkarha, pokar-mal.
COMPOSITÆ.
F. B. I. iii. 307.
The Plains to 5,000 ft.
Dharmpur.

medium size, annual, velvety or hairy; leaves ¾-1½ in., ovate, lanceolate, stalked, toothed, sometimes entire, flowers white or yellow in discoid or rayed conical heads, ½-¾ in. long, solitary on long stalks, bracts of the heads green, lanceolate in two rows, receptacle conical, covered with concave scales, pappus none or 1 or 2 bristles, outer ray flowers one row, female, white or yellow, ligule short; inner disk flowers 2-sexual, tubular, 4-5 toothed; achenes flattened, enclosed in a scale. The seeds are pungent and are used medicinally for toothache and as a pot herb.

Guizotia abyssinica,
COMPOSITÆ.
F. B. I. iii. 307.
The Plains east of the Sutlej (Gurgaon.)

medium size, annual, velvety, leafy upwards, stout; leaves 3-5 in., upper often alternate, ovate-lanceolate, or lanceolate-oblong, or linear, sessile, half stem-clasping, blunt-pointed, sharply toothed, flowers inner tubular, outer ligulate, yellow in stalked axillary or terminal heads ½-1 in. diam., bracts of heads 5, almost in two series, outer almost leaf-like, broadly oblong or ovate, blunt, green, inner like the scales of the floor of the head, pappus hairs none, outer corollas ligulate, few, 2-3-toothed, inner tubular 5-toothed, anther bases abrupt, entire, style arms hairy, achenes smooth, flattened, tip rounded.

Bidens cernua,
COMPOSITÆ.
F. B. I. iii. 309.
Kashmir.
Chamba, 5-6,000 ft.
(Thompson.)

medium size, stout, annual, smooth; leaves 3-5 in., toothed, base sometimes nearly united; flowers yellow in drooping clustered or nearly solitary discoid heads, ⅔-1 in. diam., bracts in 2 rows, united below, outer green, inner dry, thin, receptacle scales narrow, flat nearly as long as the flowers, pappus of 2-4 stiff, barbed bristles, flowers tubular, 5-toothed, achenes flattened, slender, black, sometimes thickened and armed with recurved spines.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

STAMENS FOUR.

Scrophularia calycina, SCROPHULARIACEÆ. F. B. I. iv. 253. Himalaya, 9-12,000 ft. Narkanda, Hattu, Chor (Collett).

medium size, annual, stem stout, angular, smooth below, sticky from glands above; leaves 1-4 in., upper alternate, ovate, ovate and heart-shaped or oblong, shortly stalked, short pointed, coarsely toothed; flowers greenish-purple, small in opposite stalked crowded clusters forming erect stiff terminal branching leafless racemes, calyx 5-fid, segments lanceolate, long-pointed, corolla tube globular, lobes 5, short, flat, 4 upper equal, erect, lowest spreading, stamens 4, in unequal pairs, turned downwards, enclosed in the corolla, staminode one, ovate, sharp-pointed, style long, stigma minute; capsule $\frac{1}{4}$-$\frac{1}{3}$ in., ovoid, long-pointed, seeds several, oblong.

Scrophularia Scopolii, SCROPHULARIACEÆ. F. B. I. iv. 254. Himalaya, 6,000 ft. Kashmir, Murree, Hazara (Fleming, Clarke).

large, stout, smooth or slightly velvety, branched; leaves 1-3 in., upper alternate, ovate, oblong, or heart-shaped ovate, coarsely toothed, stalk $\frac{1}{2}$-1 in.; flowers small, greenish in loose-flowered erect clusters, lower axillary, upper alternate, forming long straight narrow leafless branching racemes 12 in. or more in length, main flower stalk and lesser flower stalks short, stout, erect, calyx lobes 5, rounded, margins thin, dry, two upper corolla lobes longer than the others, stamens enclosed in the corolla, staminode round; capsule ovoid, beaked, seeds wrinkled, in other respects like the last species.

Scrophularia polyantha, SCROPHULARIACEÆ. F. B. I. iv. 255. Himalaya, 4-11,000 ft.

large, annual, stout and smooth below, velvety sticky above, stem slightly 4-angled; leaves 2-8 in., upper alternate, ovate or ovate and heart-shaped, round toothed, sometimes lobed at the base, leaf stalk $\frac{1}{2}$-1 in. long, sometimes with projections; flowers greenish, very small in stiff erect very large branched leafless racemes, flower stalks

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

STAMENS FOUR.

short, calyx 5-fid, segments rounded, margins thin, dry, corolla 5-lobed, very short, 2 upper lobes much longer than the lateral, stamens 5, in unequal pairs, far protruding, staminode broad, style thread like; capsule round, seeds somewhat wrinkled.

Buchnera hispida,
SCROPHULARIACEÆ.
F. B. I. iv. 298.
The Plains to 9,000 ft.
Valleys below Simla (Collett).
Dharmpur.

small to medium size, annual, stiff, slender, bristly, often branched above; leaves 1-2 by $\frac{3}{4}$-$1\frac{1}{2}$ in., lower oblong or ovate broad at the apex, upper linear oblong or lanceolate, toothed or not, blunt pointed; flowers white or pale purple, $\frac{1}{3}$ in. long, sessile, solitary, in the axils of leaves forming terminal spikes, 6-10 in. long, calyx $\frac{1}{6}$ in., tubular 5-toothed bristly, corolla lobes 5, spreading, nearly equal, stamens 4 in unequal pairs, enclosed in the corolla, style short, stigma round; capsule oblong, shorter than the calyx, seeds very many, oblong, netted.

Verbena officinalis,

see Herbs, Erect, Opposite, Exstipulate, Lobed.

Hemigraphis latebrosa, var. rupestris,
ACANTHACEÆ.
F. B. I. iv. 423.
Koti above Kalka.

medium size, branches many, spreading velvety; leaves $2\frac{1}{2}$ by 1-$1\frac{1}{2}$ in. long, pointed at both ends, ovate, toothed, leaf stalk 1-$1\frac{1}{2}$ in., on the secondary flowering branches much smaller, bracts ovate, scarcely longer than the calyx, except in the outermost flowers where they are stalked; flowers $\frac{2}{3}$-$\frac{3}{4}$ in., blue, sessile in dense heads terminal or nearly axillary on short branchlets, bracteoles none, calyx 5-fid, segments linear lanceolate, nearly equal, $\frac{1}{3}$-$\frac{1}{4}$ in., whitish, hairy, corolla narrowly tubular funnel-shaped, tube white or yellowish, lobes blue, 5, rounded, stamens 4, in unequal pairs, just enclosed in the corolla, longer pair bearded in the upper half, shorter pair smooth, anthers triangular, sharp-

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LEAF MARGINS TOOTHED.

PETALS UNITED.

STAMENS FOUR.

pointed, style long, unequal lobes; capsule $\frac{1}{4}$ in., linear, hairy, seeds 6, hairy when wet.

Strobilanthes atropurpureus, ACANTHACEÆ. F. B. I. 472. Himalaya, 6-10,000 ft Simla, Matiana Hattu (Collett). Murree (Douie).

small to medium size, perennial, flowering at intervals of several years, growing in forests and swampy ground, velvety, sometimes sticky, stem 4 angled or furrowed; leaves 2-4 by $1\frac{1}{2}$-2 in., ovate or ovate lanceolate smooth, round or sharp toothed, tapering into a winged stalk; flowers blue, $1\frac{1}{4}$ in. solitary or in pairs at intervals on spikes 1-6 in. long, bracts leaf-like, persistent, bracteoles linear, calyx 5-fid, segments linear, corolla-tube curved, cylindric below, dilated above, pale blue, lobes 5, dark blue, nearly equal, rounded, $\frac{1}{2}$-$\frac{3}{4}$ in. across, stamens 4, in unequal pairs on the corolla tube alternate with the lobes, anther bases blunt, style tip curved back; capsule $\frac{3}{4}$ in. long, oblong, sticky, seeds $\frac{1}{8}$ in., 4 or less.

Acrocephalus capitatus, LABIATÆ. F. B. I. iv. 611. The Plains to 5,000 ft. In moist places.

small, annual, slightly velvety, branched from the base or not; leaves $\frac{1}{2}$-1 in., ovate or lanceolate, coarsely toothed, narrowed to the stalk; flowers $\frac{1}{6}$ in. pale purple, sessile, crowded in stalked terminal round heads, $\frac{1}{2}$ in. diam., with 2 spreading leaves at the base, calyx 2-lipped, upper lip undivided, flat, lower shorter 4-toothed, corolla tube very short, nearly equally 4-lobed, stamens 4, nearly equal, enclosed in the corolla, toothless, style 2-fid; nutlets smooth.

Pogostemon plectranthoides, LABIATÆ. F. B. I. iv. 632. Himalaya, 1-5,000 ft. Sutlej Valley. Suni (Collett).

large, perennial, strongly scented, velvety, bushy, branches round, often purple; leaves 3-6, ovate, stalked, long-pointed, coarsely and irregularly toothed; flowers $\frac{1}{4}$ in., pinkish-white, in large circular clusters in many cylindric spikes, forming terminal erect branching racemes, floral leaves

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LEAF MARGINS TOOTHED.

PETALS UNITED.

STAMENS FOUR.

bract-like, hairy, glandular, ovate, short-pointed; calyx tubular, 5-toothed, teeth nearly equal, corolla tube-curved, longer than the calyx, 4-lobed, lobes nearly equal, blunt, stamens 4 nearly equal, protruding far, lilac, bearded with long lilac beaded hairs, style 2-fid; nutlets smooth.

Dysophylla crassicaulis, LABIATÆ. F. B. I. iv. 640. Himalaya, 2-4,000 ft. Kashmir. Chama, Kulu.

medium size, annual, smooth, strongly smelling, found in swamps; leaves 4-6 in a circle, 1-2 in. long narrowly oblong or lanceolate, toothed, blunt; flowers minute, blue purple, in large circles crowded on slender cylindric terminal spikes 1-4 in. long, bracts lanceolate broad towards the tip, calyx minute, ovoid, 5-toothed, teeth erect or converging, corolla minute, 4-lobed, upper lobe 2-fid or undivided, lower spreading, stamens 4, protruding, very long, bearded, style 2-fid: nutlets very small, circular, flattened, pale, shining.

Elsholtzia incisa, LABIATÆ. F. B. I. iv. 644. Himalaya, 3-5,000 ft.

medium size to large, branches 4-angled; leaves 1-2 in., broadly ovate, blunt pointed, coarsely round-toothed, stalk long, winged above; flowers very small, white in very slender cylindric spikes 2-4 in. long, bracts small, slender, calyx sessile, sticky, 5-toothed, bell-shaped, enlarged in fruit, corolla 4-lobed, upper lobe nearly erect, notched, the others spreading, stamens 4 in unequal pairs, protruding, not bearded, style 2-lobed, lobes awl-like; nutlets smooth, shining.

Elsholtzia strobilifera, LABIATÆ. F. B. I. iv. 645. Himalaya, 5-10,000 ft. Simla (Collett).

small to medium size, slightly hairy; leaves ½-1 in., ovate, stalked, round or sharp-toothed; flowers minute, pale purple on cylindric hairy or velvety cone-like spikes ½-1½ in., bracts broad, thin, fringed, forming cups nearly concealing the flowers, calyx

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LEAF MARGINS TOOTHED.

PETALS UNITED.

STAMENS FOUR.

thin, transparent, tubular, corolla-tube slender, longer than the calyx, lobes 4, stamens and style as in the last species; nutlets red brown, shining.

Elsholtzia cristata,
LABIATÆ.
F. B. I. iv. 645.
Himalaya, 1-9,000 ft.
Simla (Collett).
Changlagalli (Douie).

small to medium size, nearly smooth, fragrant; leaves 1-4 in., lanceolate, coarsely toothed, long-stalked, long-pointed, thin;, gland-dotted beneath; flowers very small, pink purple in broad velvety one-sided spikes 1-2½ in., bracts stalked leaf-like, round with a sharp abrupt point, calyx tubular, hairy, corolla tube curved, stamens style and nutlets as in the last species.

Perilla ocimoides,
Bhanjiri.
LABIATÆ.
F. B. I. iv. 646.
Himalaya, 2-5,000 ft.
Valleys below Simla (Collett).

medium size, annual, aromatic, shaggy; leaves 3-5 in., ovate or rounded, blunt, sharp or round-toothed, stalk 1-3 in.; flowers white, small in pairs on long one-sided erect axillary and terminal simple or branching racemes, bracts lanceolate as long as the flowers, calyx bell-shaped, 5-toothed, becoming much larger 2-lipped in fruit, corolla 5-lobed, stamens 4, hardly protruding, style 2-fid; nutlets nearly round, netted.

Mentha sylvestris,
Horse Mint,
LABIATÆ.
F. B. I. iv. 647.
Himalaya, 4-12,000 ft.
Simla in wet places (Collett).
Baluchistan (Aitchison).

medium size, strongly scented, perennial; leaves 1-3 in., lanceolate, ovate or oblong, sharply-toothed, nearly sessile, short-pointed, grey velvety above, white-felted below; flowers lilac, small in large clusters, crowded on axillary and terminal cylindric tapering spikes 1-3 in., bracts lower leaf-like, upper smaller, lanceolate, calyx sharply 5-toothed, bell-shaped, hairy, corolla 4-lobed, lobes erect nearly equal, stamens 4, equal, protruding not bearded, style arms short; nutlets netted: *var. incana* is generally grey-felted.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

STAMENS FOUR.

Mentha arvensis, LABIATÆ. F. B. I. iv. 648. Kashmir, 5-10,000 ft. Baluchistan (Maynard).

medium size, hairy or smooth; leaves 1-2 in., flowers in round axillary head-like clusters, in other respects like the last species.

Micromeria biflora and hydaspidis,

see Shrubs, Opposite, Exstipulate, Simple, Corolla Two-lipped.

COROLLA ONE-LIPPED.

Blepharis sindica, ACANTHACEÆ. F. B. I. iv. 479. The Plains.

small, rough or prickly; leaves 1-2 in., linear or narrowly oblong, velvety, toothed or spinous; flowers $\frac{1}{2}$-$\frac{2}{3}$ in., blue in few or many-flowered, 2-3 in. long spikes, bracts 1 in. or more, ovate with spreading lanceolate tips, prickly, hairy within and without, bracteoles $\frac{1}{3}$ in., linear, hairy, shorter than the bracts, calyx 4-lobed, two outer lobes $\frac{2}{3}$ in., ovate, 2 inner $\frac{1}{3}$ in. narrowly ovate, corolla-tube ovoid, horny, one-lipped, the lower broad, 3-lobed, stamens 4, in unequal pairs, thick, rigid, anterior pair have a process above the anthers, anthers densely bearded, style linear, very shortly 2-fid; capsule $\frac{1}{3}$ in. oblong with rounded ends, flattened, shining brown, seeds 2, $\frac{1}{4}$ in., prickly.

Blepharis edulis, ACANTHACEÆ. F. B. I. iv. 479. The Plains. Baluchistan (Stocks.)

very like the last, but larger with large leaves and larger corolla.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA ONE-LIPPED.

Tencrium quadrifarium, Germander,
LABIATÆ.
F. B. I. iv. 701.
Himalaya, 4-8,000 ft.
Simla (Collett).

large, stout stem square, nearly round below, hairy; leaves 2-3 in., ovate or oblong ovate, shortly-stalked, base heart-shaped, short-pointed, toothed, often wrinkled, flowers purple, ½ in. long, sessile in pairs on one side of erect branching racemes, bracts ½ in., broadly ovate, abruptly ending in a long point, hairy near the base, concealing the flowers, red purple, calyx ⅙ in., upper lip rounded, 2 lower short pointed or blunt, corolla 1-lipped, upper lip none, lower lip 5-lobed, long, broad, lateral lobes tooth-like, short pointed, terminal lobe broad, concave, stamens 4, in unequal pairs, protruding from the corolla-tube, style undivided; nutlets minute, wrinkled.

COROLLA TWO-LIPPED.

STAMENS TWO.

Bonnaya brachiata,
SCROPHULARIACEÆ.
F. B. I. iv. 284.
The Plains to 5,000 ft.
Valleys below Simla (Collett.)

small, erect or prostrate, rigid, annual, quite smooth; leaves ½-1½ in. oblong, blunt or short-pointed, sessile, sharply deeply toothed; flowers ¼ in. long, white, spotted or tinged with pink, bracteate, on short axiliary stalks, forming terminal racemes, calyx 5-lobed, segments linear, corolla 2-lipped, upper lip erect, undivided, lower broad, 3-lobed, stamens 2 only, as one pair are aborted, stigma flat, 2-lobed; capsule narrow cylindric, much longer than the calyx, seeds many, wrinkled.

Mosla dianthera,
SCROPHULARIACEÆ.
F. B. I. iv. 647.
Himalaya, 1-6,000 ft.
The Plains to 6,000 ft.

medium size, annual, strong scented, slender, slightly velvety; leaves 1-1½ in., ovate, short-pointed, toothed, stalked; flowers ¼ in. long, white or purplish in twos on one-sided terminal and axillary racemes, bracts very minute or the lower leafy, calyx bell-shaped, 5-toothed, nearly equal

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LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS TWO.

or 2-lipped, base pouched, corolla 2-lipped, upper lip notched, lower 3-lobed, lips short, stamens 2 on the posterior side, short, erect, apart, staminodes 2; nutlets 4, round, smooth or netted.

Salvia glutinosa, Sage,
LABIATÆ.
F. B. I. iv. 653.
Himalaya, 6-9,000 ft.
Simla (Collett).
Baluchistan (Lace).

large, perennial, very sticky, hairy, strongly scented; leaves 4-7 by 2-4 in., ovate oblong, two processes sticking out at the base, like a barbed arrow head, toothed, leaf stalk 1-3 in.; flowers 1-1½ in., yellow, shortly stalked in large branched erect spreading racemes, floral leaves very small, calyx widely bell-shaped, ½ in., upper lip ovate, short pointed, corolla-tube longer than the calyx, 2-lipped, upper lip dotted with purple, long, curved, flattened from side to side, concave, lower wide, 3-lobed, stamens 2, wide apart, each dividing into two horns, upper horn with a perfect anther, lower with none, style long curved projecting from the concavity of the upper lip, 2-fid; nutlets 4, triangular, ⅛ in., smooth.

Salvia hians,
LABIATÆ.
F. B. I. iv. 653.
Himalaya, 8-11,000 ft.
Kashmir (Falconer).

very like the last species, but leaf-stalk much longer, often 10 in., leaves broader, calyx much wider, corolla 1½ in., blue, lips shorter, nutlets larger.

Salvia asperata,
LABIATÆ.
F. B. I. iv. 654.
Himalaya, 5-6,000 ft.
Kashmir (Falconer).

medium size, perennial, rough, branched, somewhat glandular and hairy; leaves 3-6 by 2-3 in., oblong ovate, heart-shaped, blunt, round-toothed, leaf-stalk long, floral leaves 1 in. diam. or less, rounded, bristly, tipped with a sharp hard point; flowers ¾ in. long, white, arranged in distant 6-10-flowered circles on an erect spike, calyx ½ in. long, widely bell-shaped, hairy, stiff, 2-lipped, upper lip

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS TWO.

3-toothed, corolla tube short slender, otherwise like the last species, stamens 2, as in the last species, but the horns connected by hard projections, bent backwards and the imperfect anther abruptly dilated, style and nutlets as in the last species but smaller.

Salvia Moorcroftiana, LABIATÆ. F. B. I. iv. 654. Himalaya, 4-9,000 ft. Shali, Solon (Collett). Sanawar. Rawalpindi. Hazara (Douie).

medium size to large, stout, woolly; leaves 6-12 by 3-5 in. oblong or rounded, heart-shaped, blunt, round-toothed, upper surface nearly smooth or cottony, closely wrinkled, under surface white-felted, thick, stalk green bordered and veined, round and abruptly pointed; flowers 1 in. long, pale blue, lilac or whitish in distant 6-10-flowered circles round an erect spike, calyx $\frac{1}{3}$ in., bell-shaped, teeth spinous, upper lip 3-toothed, rough, corolla, stamens, style and nutlets as in the last species, but larger.

Salvia lanata, LABIATÆ. F. B. I. iv. 654. Himalaya, 5-8,000 ft. Simla (Collett). Murree.

very like the last species, but rather smaller, more woolly, leaves not stalked, flowers blue-grey, $\frac{3}{4}$ in. long.

Salvia dumetorum, LABIATÆ. F. B. I. iv. 655. Kashmir, 6,000 ft. (Falconer, Clarke).

large, perennial, very stout, much branched, hairy, felted or velvety; leaves 3-4 by $1\frac{1}{2}$-$2\frac{1}{2}$ in., ovate or oblong heart-shaped, doubly round-toothed, somewhat wrinkled above, leaf-stalk 1-4 in., floral leaves small, rounded with a hard sharp point $\frac{1}{6}$ in. long; flowers $\frac{1}{2}$-$\frac{2}{3}$ in. long, blue in sticky distant 6-flowered circles round an erect-spike, calyx $\frac{1}{4}$ in., nearly sessile, ovate bell-shaped, 2-lipped,

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS TWO.

upper lip curved back with 3 converging teeth, lower abruptly 2-toothed, corolla, stamens, style and nutlets as in the last species.

Salvia plebeia,
LABIATÆ.
F. B. I. iv. 655.
The Plains to 5,000 ft.
Sutlej Valley, Suni (Collett).

medium size, annual, stem stout, roughly velvety; leaves 1-3 in., ovate or oblong, toothed, blunt, stalked, floral leaves small, upper lanceolate; flowers ¼ in. long, lilac or nearly white in numerous small circles in several slender branching racemes, calyx ⅛ in. stalked, upper lip not toothed, corolla 2-lipped, upper lip short, nearly straight, stamens, style and nutlets like the last species but smaller.

Salvia ægyptiaca,
LABIATÆ.
F. B. I. iv. 656.
The Plains, 1-2,000 ft.
Chakwal, Jhelum Dist. (Douie).
Baluchistan (Hughes-Buller).

small, perennial, hairy, stiff, much branched from the base; leaves hardly 1 in. long, linear or lanceolate, short-pointed, rigid, round-toothed; flowers small, ⅕ in. in distant 2-3-flowered circles, calyx with hairy glands, upper lip round, minutely 3-toothed, lower lip, 2 awl-shaped teeth, corolla, stamens, style and nutlets as in the last species.

STAMENS FOUR.

Sesamum indicum,
Gingelly,
Til.
PEDALIACEÆ.
F. B. I. iv. 387.
The Plains.
Baluchistan.

medium size, annual, velvety; leaves 3-5 in., oblong or ovate toothed, upper alternate, lower opposite, often lobed; flowers 1¼ in., white or purplish, sometimes marked with yellow, axillary, solitary or a few clustered together on short stalks, calyx ¼ in., 5-fid, segments lanceolate, corolla 2-lipped, velvety, tube swollen out, nearly pouched

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

at the base, lobes 5, rounded, stamens 4, in unequal pairs, enclosed in the corolla, anthers divided at the base, style thread-like, stigma 2-lobed; capsule 1 by $\frac{1}{4}$ in., erect, rough, 4-angled, oblong, pointed, seeds many, brown, oblong. This plant is cultivated for the oil which is expressed from the seeds.

Mimulus gracilis, see Herbs, Erect, Opposite, Exstipulate, Simple Entire.

Lindenbergia macrostachya,
SCROPHULARIACEÆ.
F. B. I. iv. 261.
The Plains to 4,000 ft.
Sutlej Valley.
Suni (Collet).

large, smooth or velvety, stem stiff, stout, or slender; leaves ovate, smooth, toothed; flowers $\frac{1}{2}$ in. long, yellow crowded in terminal or axillary, one-sided, rigid spikes, bracts shorter than the calyx, calyx 5-fid, bell-shaped, corolla 2-lipped, upper lip recurved, 2-lobed, lower lip much larger, 3-lobed with 2 permanent folds at the base, stamens 4, in unequal pairs, enclosed in the calyx, style slender, stigma 2-lobed; capsule lanceolate, 2-grooved, seeds many, minute.

Lindenbergia polyantha,
SCROPHULARIACEÆ.
F. B. I. iv. 262.
The Plains to 6,000 ft.
On walls and banks.

medium size, coarsely velvety, stout or slender; leaves $\frac{1}{2}$-$\frac{3}{4}$ in. long, ovate, blunt, round-toothed, stalk short; flowers yellow, $\frac{1}{3}$ in. long, on one-sided axillary and terminal leafy spikes, 2-6 in. long, bracts ovate, longer than the calyx, calyx $\frac{1}{6}$ in. long, 5-fid, lobes blunt, corolla, stamens and style as in the last species; capsule smooth above, hairy below, otherwise capsule and seeds as in the last species.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

Lindenbergia urticæfolia, SCROPHULARIACEÆ. F. B. I. iv. 262. The Plains to 6,000 ft. Simla, Mashobra. Common on walls (Collett). Choa Saidan Shah (Douie). Baluchistan (Boissier.)

small, annual, slender, rough from glands or nearly smooth; leaves 1-1½ in. long, ovate, blunt, round-toothed, thin, stalk ¼-¾ in.; flowers ⅓ in., yellow, shortly stalked one-sided all axillary, and solitary, or in pairs, or in leafy slender spikes, bracts longer than the calyx, calyx ⅙ in., lobes turned back, corolla slightly hairy, capsule hairy above the middle, other characters like the last species.

Herpestis hamiltoniana, see Herbs, Erect, Opposite, Exstipulate, Simple, Margins Entire.

Torenia cordifolia, SCROPHULARIACEÆ. F. B. I. iv. 276. The Plains to 6,000 ft. Valleys below Simla (Collett). Kothi.

small, annual, stems and branches 4-angled; leaves 1-1½ in., ovate, sharply toothed, stalked; flowers ¾ in. long, lilac or blue purple solitary on axillary stalks, crowded at the end of branches, calyx ½ in., ovoid or oblong, winged, base rounded or heart-shaped, corolla 2-lipped, upper lip erect, concave, notched, lower larger, spreading, 3-lobed, tube cylindrical, dilated above, stamens 4, in unequal pairs, style linear curved, stigma flat, 2-lobed; capsule oblong, short-pointed, seeds many, wrinkled.

Vandellia crustacea, see Herbs, Erect, Opposite, Exstipulate, Simple, Margins Entire.

Vandellia erecta, see Herbs, Erect, Opposite, Exstipulate, Simple, Margins Entire.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

Vandellia nummularifolia, SCROPHULARIACEÆ. F. B. I. iv. 282. Himalaya, 2-7,000 ft. Valleys below Simla (Collett). Kasauli.

small, smooth, annual, stem 4-angled; leaves $\frac{1}{2}$-$\frac{3}{4}$ in., nearly round, round toothed, sessile or nearly so; flowers $\frac{1}{4}$ in. long, red-purple, edges white on axillary stalks or few-flowered racemes, calyx 5-toothed, $\frac{1}{8}$ in., corolla 2-lipped, upper lip erect, broad concave, notched, lower spreading 3-lobed, stamens 4, lower pair with a broad tooth, stigma 2-lobed; capsule $\frac{1}{4}$ in. long, much longer than the calyx, long, pointed, seeds wrinkled.

Vandellia sessiliflora, SCROPHULARIACEÆ. F. B. I. iv. 282. Himalaya, 2-7,000 ft. Kashmir.

like the last species, except that the flowers are sessile as the specific name implies.

Euphrasia officinalis, Eyebright, SCROPHULARIACEÆ. F. B. I. iv. 305. Himalaya, 7-13,000 ft. Mahasu, Fagu, Hattu (Collett).

small, velvety, glandular, branching, slender; leaves $\frac{1}{4}$-$\frac{1}{2}$ in. ovate, sessile, sharply toothed; flowers $\frac{1}{4}$-$\frac{1}{2}$ in., white or lilac, purple-veined, throat tinged with yellow in terminal spikes, bracts leaf-like, calyx 4-lobed, tubular, corolla 2-lipped, tube cylindric, longer than the calyx, upper lip erect, 2-lobed, lower spreading, 3-lobed, lobes notched, stamens 4, in unequal pairs, anthers hairy, lower pair long-spurred, style long, stigma round; capsule oblong, flattened, seeds many, oblong, grooved.

Bartsia Odontites, SCROPHULARIACEÆ. F. B. I. iv. 303. Kashmir, 7-8,000 ft. (Clarke).

medium size, annual, rough, wiry, 4-angled, branched, branches ending in leafy spikes; leaves $\frac{1}{4}$-2 in., lanceolate, somewhat toothed, sessile; flowers $\frac{1}{2}$ in., pink in nearly one-sided spikes, lower bracts leafy, calyx 4-fid, bell-shaped, lobes ovate, short-pointed, equal to the tube, corolla 2-lipped, velvety, tube slender, upper lip erect, long, entire, lower

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

convex, 3-lobed, stamens 4 in unequal pairs, under the upper lip, anthers yellow, spurred, protruding; capsule ¼ in., longer than the calyx, seeds many, narrowly oblong.

Phryma leptostachya, VERBENACEÆ. F. B. I. iv. 561. Himalaya, 3-7,000 ft. Valleys below Simla (Collett).

medium size, thinly hairy; leaves 2-4 in., ovate or ovate-lanceolate, stalked, toothed; flowers ¼-⅓ in. long, pink in long slender terminal or axillary spikes 6-15 in. long, bracts linear, small, bracteoles minute, calyx ¼ in., tubular, teeth 3, linear, with purple hooks, corolla small, tubular, 2-lipped, upper lip erect, concave, notched, lower larger, spreading, 3-lobed, stamens 4 in unequal pairs, enclosed in the corolla, style 2-lobed; capsule dry, oblong, enclosed in the reflex calyx, seed solitary, loose.

Ocimum basilicum, see Herbs, Erect, Opposite, Exstipulate, Simple, Margins Entire.

Ocimum sanctum, see Herbs, Erect, Opposite, Exstipulate, Simple, Margins Entire.

Orthosiphon pallidus, LABIATÆ. F. B. I, iv. 613. The Plains to 5,000 ft. Kashmir.

small, perennial, smooth or slightly velvety, stout, woody stock, branches many; leaves ½-2 in., ovate, blunt, coarsely sharp or round-toothed, stalk ¼-½ in., the length of the leaf blade; flowers white, ⅛ in. long, in long or short, stout or slender racemes, bracts minute, calyx ovoid, fruiting calyx turned down, upper tooth broad, thin, lateral and lower awl-shaped, corolla-tube equal to the calyx, 2-lipped, upper lip 3-4-fid, lower undivided concave, stamens 4, curved forward, enclosed in the corolla, nutlets nearly round, flattened, pale, nearly smooth.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

Orthosiphon rubicundus, LABIATÆ. F. B. I. iv. 615. Himalaya, 2-5,000 ft. — medium size, perennial, felted, velvety or smooth, stems 4-angled; leaves 2-4 in. long, corolla white or pink, twice as long as the calyx, nutlets minutely pitted, otherwise like the last species.

Plectranthus, Gerardianus, LABIATÆ. F. B. I. iv. 617. Himalaya, 3-9,000 ft. Simla (Collett). — large, perennial, smooth; leaves 3-7 by 1-4 in., ovate, long-pointed, round-toothed, lower leaves stalked, floral leaves and bracts small; flowers white and purple, dotted, ¼ in. long, in small clusters forming axillary or terminal branched racemes, calyx bell-shaped, elongated and curved in fruit, gland-dotted, corolla 2-lipped, upper lip short, broad, recurved, 3 or 4-lobed, lower longer, boat-shaped, undivided, stamens 4, in unequal pairs along the lower lip of the corolla, ununited, projecting, style nearly equally divided; nutlets oblong with rounded ends.

Plectranthus striatus, LABIATÆ. F. B. I. iv. 618. Himalaya 4-8,000 ft. Simla (Collett). — small and roughly velvety, otherwise like the last species.

Plectranthus coëtsa, LABIATÆ. F. B. I. iv. 619. Himalaya, 3-8,000 ft. Simla. — large, perennial, velvety, strong smelling; leaves 2-4 by 1-2½ in., ovate or ovate-lanceolate, sharp or round-toothed, corolla lavender-blue, tube abruptly bent, much longer than the calyx, otherwise like the last species.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

Plectranthus ternifolius, LABIATÆ. F. B. I. iv. 621. The Plains to 5,000 ft. Valleys below Simla (Collett). — large, densely white-felted; leaves sometimes in threes round the stem or branches, corolla white, nutlets 3-angled, otherwise like the last species.

Plectranthus incanus, LABIATÆ. F. B. I. iv. 621. The Plains from 1-6,000 ft. Valleys below Simla (Collett). — medium size, velvety; leaves 2-4 in., broadly ovate, calyx 2-lipped, lower lip with 3 long-pointed teeth, corolla pale lavender-blue, tube nearly straight, lower lip very long nutlets large nearly round, otherwise like the last species.

Coleus barbatus, LABIATÆ. F. B. I. iv. 625. Himalaya, 2-7,000 ft. Valleys below Simla (Collett). — medium size, stem stout, hairy; leaves 3-5 in., ovate, blunt, round-toothed, stalked, upper surface hairy, lower felted, flowers $\frac{3}{4}$-1 in. long, pale blue in circular clusters of 6-8 forming long, leafless, spike-like racemes, bracts ovate, soon falling off, upper calyx-lip rounded, ovate, short-pointed, 5-toothed stamens united below, other characters like those of the last species.

Coleus aromaticus, LABIATÆ. F. B. I. iv. 625. The Plains cultivated. — medium size, very aromatic; leaves broadly ovate, corolla pale purplish, stamens shortly protruded, other characters like those of the last species

(*To be continued*).

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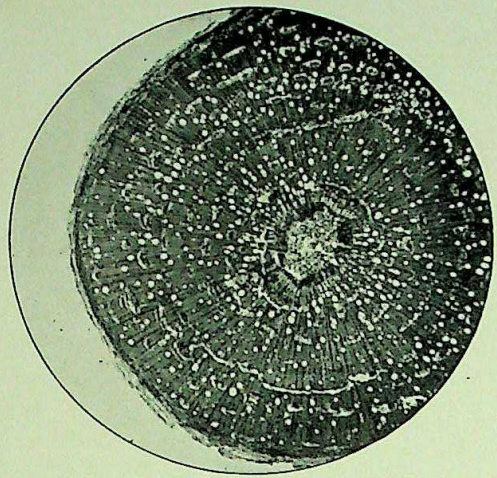

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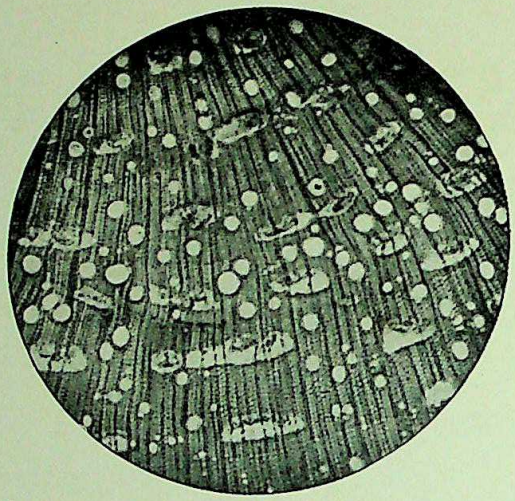

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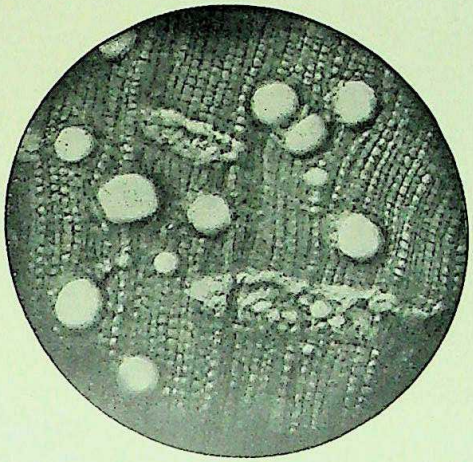

3

SECTIONS OF *CALYCOPTERIS FLORIBUNDA.*

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A NOTE ON THE STRUCTURE OF THE GIANT CREEPER *CALYCOPTERIS FLORIBUNDA.*

BY

PROFESSOR V. N. HATE, B. SC.

(With a Plate.)

The plant *Calycopteris floribunda*, also called *Getonia floribunda* is fully described morphologically in all works on Bombay Flora. But this morphological description will not assist us in understanding the phenomenon of the dripping of water exhibited by the plant, when a piece of the stem, nearly a foot in length and stout as one's wrist, is cut off from the entire plant, to which attention has been drawn by Mr. Wallace, C. E.

In connection with this phenomenon a little consideration will tell us that it resolves itself into two factors, namely, that there must be a mechanism for readily absorbing and retaining large quantities of water in the body of the plant and that there must be the means for preventing free evaporation or escape of water from the body of the plant. To understand properly these two things we must examine microscopically, the structural details of the plant and study its surroundings. We shall consider the latter first. This plant grows more or less upon rocky soils, exposed to great heat, subject to great variations of temperature during 24 hours and long periods of drought. In short the plant grows in such conditions that it may be called a xerophyte. Now all xerophytes show a definite response in their structure to their environment, and thus we are led to examine closely the structural details of this plant to make out any special adaptations, and we find we are not disappointed in that.

The stem has the general structure of a Dicotyledonous plant, being monostelic and having open fibrovascular bundles. A section of a very small twig examined microscopically shows a closely packed arrangement of numerons fibrovascular bundles with medullary rays reduced merely to radial lines. The secondary formations of wood or xylem are very peculiar indeed. They are almost formed of closely packed lignified wood-fibres or prosenchymatous fibres with pitted walls (called Tracheids),

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including here and there large pitted vessels, with very little wood-parenchyma (Fig. 1). One cannot help observing here the marked resemblance, this secondary wood bears in general to the secondary wood of the Coniferæ most of which are xerophytic. The wood fibres of this plant show (in transverse and longitudinal sections) a definite cavity, so that we have here a tissue made up of numerous closed capillary tubes. This peculiarity of the wood is itself a special adaptation to conserve large quantities of water in the body of the plant, and at the same time affords facilities to the transport of the cell-sap or watery solution towards the leaf. How the cell-sap travels through the root and stem and arrives at the leaves is not the question at issue. The transport of cell-sap through lofty woody stems is one of the ill-solved problems of vegetable physiology. Opening that question here in connection with the phenomenon to be explained would avail us nothing.

A concomittant feature resulting from this abundance of wood-fibres thus closely packed, and lessening of the wood-parenchyma is the great reduction of the intercellular space system in the body of the plant. The effect of it is that very little quantity of water must be evaporating internally.

The microscopic structure of a sufficiently grown older branch which may be taken as the type of the structure obtaining in all parts of the grown stem of any width, presents, in addition, still further special features. The wood goes on increasing under the action of the vital region. Cambium in rings, and is formed, as before, of abundance of closely-packed wood-fibres with fitted walls and of numerous fitted vessels comparatively of small diameter (fig. 2). The wonder is not that there are so many pitted vessels of the ordinary kind, but the wonder is that there are not more of these. The most important special structural feature of the stem, as it advances in age, is the formation in it by the Cambium in a regular order of the large calibred ducts or conduits filled with phlœm tissue called the Interxylem Phlœm. The phlœm tissue is made up of sieve-tubes and phlœm parenchyma and contains large quantities of cell-sap (Fig. 3). These conducts of inter-xylem phlœm are not running as continuous tubes in their longitudinal extent, but are short tubes interrupted at both ends and placed one over the

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other at different levels. Here, again, we have in the stem of this plant, an adaptation in the form of these conduits of inter-xylem phlœm for storing large quantities of water in the stem. The thin cells in these conduits, when fully turgid, must be holding large quantities of water which they draw by osmosis from the neighbouring wood-fibres and wood-vessels in connection with which these ducts and the number of them formed in this plant (Fig. 2), these reservoirs of water appear to be the special provision of water by Nature in the plant to be drawn upon in emergency.

Coming to the leaf, the size of the leaf (to my mind) appears to be comparatively small for such a giant woody creeper, taking into consideration other climbing plants belonging to the same Natural Order, *e.g.*, *Quis-qualis*, *Combretum*, &c. This reduction of the leaf area appears in the first instance calculated to reduce transpiration which means reservation of water in the stem. In the microscopical examination the leaf appears to belong to that type known as the dorsiventral. The epidermis appears to be one cell deep. On the upper surface it is strongly cuticularised and devoid of stomata having conical hairs. On the lower surface the epidermis is thin, and is made up of flat sinuous cells round about the stomata which are on the same level with them, and of somewhat cylindrical cells in the regions of the principal veins. The cylindrical epidermal cells give rise to conical hairs, whilst very peculiar watch glass shaped reddish glandular hairy scales are seen freely distributed but symmetrically arranged in small pits in connection with the sinuous epidermal cells. Some allusion to these peculiar hairy scales is found in Gibson's Bombay Flora, 1861, where the leaves are described as "resinous dotted beneath the young ones tomentose." Also in Theodore Cooke's Bombay Flora of recent date, where he says "both surfaces more or less tomentose, the lower rusty and pitted." The development in pits of these numerous hairy scales and their symmetrical arrangement must have some significance. The resinous excretions of these hairy scales must absorb dew at night-time, and thus the turgidity of at least the cells of the leaves is insured during the night-time after the exhausting work performed by them during the day. These hairy scales must be, therefore, absorbing some quantity of water in the

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form of dew, though it may not lead to any great storage of it in the stem. At any rate, these scales must be denoting a special mechanism for providing some water to the plant, which means a prevention of the loss of initial water.

In conclusion, it may be said that all the structural peculiarities of the plant point towards the storage of large quantities of water in the stem.

In connection with the dripping of water from the cut portion of the stem, the chief agency concerned in this phenomenon is the presence of those numerous conduits of inter-xylem phlœm. The turgid parenchymatous cells and the tubes cut through must shrink and bleed, and in doing so must be drawing upon the water locked up in similar cells above and in the surrounding woody tissue, so that a sort of current of water must be set up towards these dripping points from every direction as lignified woody tissue parts with its water readily and at the same time affords the easiest passage for the transit of water through it.

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REVIEWS.

FAUNA OF INDIA.

COLEOPTERA LAMELLICORNIA, I.

CETONINÆ AND DYNASTINÆ.

BY

G. F. ARROW.

This volume is the third dealing with the beetles of India and covers two groups of beetles, the Cetoniids and Dynastids, familiar to all collectors of beetles in this country. The Editor, Mr. A. E. Shipley, writes a short preface, as does the author. There is a useful glossary of technical terms, and an extremely good introduction which not only enables any one to understand and use the volume but which deals with biology. There is a marked absence of anything to do with zoo-geography, which is inevitable perhaps when both authors and editor are wholly unfamiliar with India, but which greatly mars the value of the work.

One other defect, due again to the disregard of India and workers in India, lies in the absence of altitude indications and the failure to indicate the sources of the specimens. *Anthracophera crucifera*, for instance, is recorded from no altitude higher than 2,000 feet, *A. dalmanni* from none lower than 5,000 feet, but there is nothing to indicate this. It would also have helped Indian workers to indicate which species were in the principal collections in India, as is done in some other volumes. These defects will be removed, we hope, in later volumes, by the simple expedient of associating with the editor or author some worker who has collected in India and knows it, and by adding in a bracket the collection from which the specimen on which locality is recorded came.

The species described number 241 Cetoniids and 46 Dynastids. The classification adopted is the usual one, but we regret that the author has not separated the dung-feeding (Laparostict) Scarabaeids from the vegetable-feeding (Pleurostict) Melolonthids as a distinct family. Of the *Cetoniini*, the first division of the *Cetoniinæ* or rose-chafers, 11 are peculiar to Ceylon, 32 to Burmah, 9 to the Western Himalayas, 16 to the Eastern Himalayas, 16 to Assam, 32 to Southern India (mainly the Nilgiris) and 4 to Sind and Baluchistan. Of the rest, 8 occur in Ceylon and South India, 7 in Burmah and Assam, 12 in Burmah, Assam and, the Eastern Himalayas, 8 only in the Eastern and Western Himalayas, 13 only in the Eastern Himalayas and Assam. Taking tropical India or the plains, 27 species are recorded, of which two are from the Deccan only, a few from Chota Nagpur, and the remainder from localities in the plains and also in the hills. Very few species are general over India in any sense at all, taking only the subtropical hill areas and the group are, so far as the records go, localised into

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district areas more than some other groups are. This is perhaps not so marked really as the records would show, as the editors and authors have been at very small pains to secure material on which to base good locality records. While they have taken immense pains to secure types, they have only drawn on half a dozen collections or collectors in India and have apparently disregarded the many other private collectors and collections. This is the weak point of this as of other volumes, and the work would be of far greater value and far more complete if the editor relied more on existing collections and made a better effort to secure them. The work will be valuable but could have been considerably more so.

The two remaining divisions of the *Cetoniinæ* are curiously localised; the *Valgini* have 20 peculiar to Burmah, 1 in Kulu, 2 peculiar to the Eastern Himalayas, 2 to Assam, 1 in Chota Nagpur, 1 in Ceylon and 5 in South India only. The *Trichiini* have 2 in Burmah and 5 in Assam.

Of the *Dynastinæ*, 1 occurs only in the Western Himalayas, 1 only in the Eastern Himalayas, 1 only in Assam, 12 only in Burmah, 1 only in Ceylon, 3 only in South India, 5 only in localities in the tropical plains and 4 in Sind or other holarctic non-oriental localities. The remainder are mainly common to the Eastern Himalayas, Assam, Burmah, either in all or in two or in any of them and in plains localities also. It is useless to analyse too far, but the plains species are nearly one-third of the total and the head-quarters of the group are the sub-tropical tracts of Burmah, Assam, Bhutan and Sikkim. Here again the locality records are shockingly scanty seeing how common Dynastids are in collections and how many amateurs have collected them.

We congratulate both editors and author on the volume, which will immensely help work at the group and which will make possible further work on the many biological problems connected with these forms. We would also urge amateur collectors and naturalists in India to turn their attention to the group, now that their identification is possible. These beetles are in every way attractive, whether for collections or as objects of observation and study, and the author has collected the recorded information on habits and biology in a very useful way. The volumes of this series are mainly intended to promote the work of naturalists in India, whether professional or amateur, by giving them the means of identifying their insects and being able to systematise their collections and record their observations. We venture to think that the needs of the Indian worker might be taken into account better and that the work might be a little more associated with the country. Such a volume takes time to prepare; Indian workers want to know that it is being prepared; that material will be appreciated and that their collections will be of use. So long as the work is wholly done in England, the important thing being to secure types and the Indian worker being neglected, so long will the volumes lack the complete-

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ness they might have. Since India pays for them, the Indian worker might have a say in the matter, which he does not. We believe that the bulk of collectors in India do not use these volumes to the extent they might and that the stimulus to work that they might afford is largely lost. For this reason, we would draw the attention of members of the society to this volume which will be of use and which will enable any one with a liking for collecting to do useful and pleasant work with these beetles.

H. M. L.

CATALOGUE OF ORTHOPTERA.

Part III.—Acridiidæ

BY

W. F. Kirby.

This is the concluding volume of the Catalogue of *Orthoptera* issued by the British Museum. It embraces the *Acridiidæ* (here called *Lecustidæ*) which include the Locusts and Grasshoppers. We congratulate the author on having brought to a conclusion this arduous work, the product of much research and delving in literature. Such catalogues, if authoritative, are invaluable to those unfortunate workers who have to deal with nomenclature and literature, and the present volume is fully up to the standard one would expect of our National Museum. The volume has, of course, no interest to any but entymologists, being purely a catalogue of species and references. Nominally such a catalogue lists the described species of the world. Actually it must include many species whose descriptions are extant, but which are practically lost for want of full descriptions and types.

Like all such catalogues, this adds to the welter of confusion that reigns in entomology by still more muddling up the nomenclature. *Acridium* or *Acrydium*, known hitherto as the designation of the old-world Locusts and allied large grasshoppers, is now transferred to a genus of *Tetrigine* grasshoppers; our locusts become *Cyrtacanthacris* and *Orthacanthacris*. Volumes have been written on *Schistocerca* (*Acridium*) *peregrinum*. Oliv., which has now become *Schistocerca tatarica*, Linn. Our old friend *Epacromia dorsalis* is become *Aeolopus tamula*. The last is very typical of the silly meddling with names now going on in all groups. *Epacromia* is a genus characterised by Fischer in November 1853 in his *Orthoptera Europæa*; our author finds that he can identify the genus with *Aiolopus* of Fieber in Lotos of May 1853. On that ground (6 months only) the generic name must change. All these changes are doubtless right, if we follow the international rules and if the author's identification of the genus is accurate; but the whole thing is bringing entomology and entomologists into contempt and disrepute with those who have to work in it and not simply tinker with nomenclature and old books. Why could not *Acridium* stand seeing what a literature there is about it under that name?

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This volume is an authoritative work issued by our National Museum and naturally workers try to follow such guides; if we cannot follow them, of what use are they; but if we do follow them, we fall ourselves and lead all our students and co-workers into a bog of nomenclature and confusion. If there were an end in sight one might hope, but there is none.

We find one other defect in this work; the author appears unable to tolerate the work of Brunner, for so many years a master of this group, and omits practically all the species he records from Burmah and India presumaably because he doubts his identification. This is a pity and one may perhaps doubt the wisdom of so many of Walker's obscurely described species being given as valid with no special authority. Walker using we believe a bit of bottle-glass as a lens, vaguely described many species in the 1870 Catalogue of the British Museum Orthoptera, these species being like many of Motschoulsky's beetles, tacitly ignored as hopeless. Here they revive, we hope, on the strength of the good specimens found in the British Museum, though we fear not.

The following is a summary of the recorded Indian, Burmah and Ceylon grasshoppers and locusts as derived from the publications quoted:—

Tetriginæ, 59, Hancock. *Genera Insectorum.*
Pneumorinæ. O.
Eumastacinæ, 22, Burr, *Genera Insectorum.*
Proscopiinæ. O.
Tryxalinæ, 37 species. This Catalogue.
Oedipodinæ, 28 ,, ,, ,,
Pyrgomorphinæ, 21 species. Boliver. *Genera Insectorum.*
Pamphaginæ, 1 species. This Catalogue.
Acridiinæ, 103 ,, ,, ,,

The group has received very little attention in India, though grasshoppers abound in the plains particularly, and their collection and study might well be an interesting work for naturalists.

H. M. L.

INDIAN BIRDS. *

Judging from the frequent enquiries we receive, there is a great opening for a popular book on the common Indian Birds. It is true that there are already several books, but all of them either deal with a certain class of birds or with those belonging to a particular district.

The author in his preface tells us that "the object of this little book is to enable people interested in our Indian birds to identify at sight those they are likely to meet with in their compound or in their excursions into the jungles." The book is divided into two parts, the first contains—

(*a*) Hindustani names.

* "Indian Birds" being a key to the "Common Birds of the Plains of India" by Douglas-Dewar.—London, John Lane.

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(*b*) Classification according to external structural peculiarities.

(*c*) Classification according to colour.

(*d*) Classification according to habits.

Of the first classification there is not much to remark and the user cannot go far wrong with it. We are afraid, however, that many mistakes will be made in using the second classification, though not through any fault of the author; but simply because people have such different ideas as to colour and also many seem to have a difficulty in remembering the colours and their arrangement on a bird, unless they have had the bird itself in their hand. There is such an immense variety and arrangement of colours amongst the birds found in India that it would seem almost impossible to classify them under any satisfactory headings, but nevertheless Mr. Dewar has managed to reduce them to order by dividing up the different colours under ten headings with numerous sub-headings. For instance, under "Grey" we have "prevailing hue grey," "the head only grey," "grey and red," &c. In many cases the same bird is found under several different colours.

The second part of the book consists of a short description of the common birds of the plains, but for the sake of brevity Mr. Dewar has, we think, spoilt what might have been a very useful list. In the first place the descriptions are all too short and secondly the geographical distribution when given, is so brief as to frequently give a wrong impression. Take the White-eyed Buzzard Eagle (*Butastur teesa*), we are told that it is "very common in N. India; rare in the south," but it is a common bird in the Deccan and near Bombay. The Red-headed Bunting (*Emberiza luteola*) is given as "a winter visitor to N.-W. and Central India" although it is also found commonly at Belgaum and Dharwar and we do not think the residents in Eastern Bengal would call *Aquila vindhina* "abundant." We mention these few instances to show that the distribution given is too brief and indefinite. It is true the author intends this book to be used along with the bird volumes of the "Fauna;" but how many of his readers will also have the "Fauna" "or" Jerdon at hand to refer to?

The omission of many of the game birds and ducks because separate works have already been written on them is, to say the least of it, unfortunate since many people do not want to be bothered with more than one book on birds.

To many, Mr. Dewar's book will be very useful, but the want of a popular book on the Common Birds of India will still be felt.

RECORDS OF THE INDIAN MUSEUM.

The discovery of the connection between insects and disease has, within the last few years, given a great impetus to the study of Diptera. We al-

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ready are indebted to Mr. E. Brunetti for much of our knowledge of Oriental blood-sucking flies and in Vol. IV, Part IV of the Records he makes an another important addition under the title of a "Revision of the Oriental Blood-sucking Muscidæ." In this paper he describes several new species belonging to the group *Stomoxinæ* and also gives the original descriptions of species described, adding where necessary redescriptions.

Dr. Annandale's energy in having the vast material under his charge classified and described is most praiseworthy and the first three parts testify to his zeal. In Part I of Volume V we have the first of a series of papers on the Hydroids in the Indian Museum by Mr. James Ritchie; this is followed by some notes on fresh water sponges, a paper on the Phylactolaematous polyzoa of India and a description of a new frog allied to *Rana tigrina*, all by Dr. Annandale himself. Under "Miscellanea" Mr. Stuart Baker records the occurrence of *Vultur monachas* in Calcutta.

In Part II Professor R. Koehler describes some new *Ophiurids* and *Holothurians* collected chiefly during the voyages of the "Investigator," while Mr. H. B. Preston writes on new marine shells brought up by the trawler "golden crown" in the Bay of Bengal.

Captain Lloyd in a short paper on Indian Rats produces some fresh evidence in favour of the opinion that discontinuous variation plays an important part in the production of new races. This is an important paper and we recommend it to all interested in variation. Besides the description of new species from Baluchistan and other places and a list of marine fish from the Karachi Market Dr. Travers Jenkins gives some interesting notes on the Spawning of Hilsa and the parental care in Siluridæ.

A new genus of Psychodid Diptera (moth flies) is described by Dr. Annandale in Part III. This genus is based on specimens taken in the Himalayas and Travancore and is named *Brunnetia* in honour of Mr. E. Brunnetti. Mr. F. H. Gravely gives a useful list of the Oriental Scolopendridæ consisting of a list of the specimens in the Indian Museum, which have been identified by Dr. Karl Kraepelin and he also describes a new subspecies of centipede taken in Calcutta. While working through the Decapoda in the Museum Collections, Mr. S. Kemp found several new species and these he has described, along with some notes on certain species, under the title of "Notes on Decapoda in the Indian Museum." There are some interesting notes on the larvæ of the mosquito *Toxrhynchitis immeserucus* which are contributed by Mr. C. A. Paiva, while Mr. B. L. Chaudhuri gives description of a new species of *Nemachilus* from Northern India. During 1909 and 1910 Mr. J. Coggin Brown of the geological survey collected on behalf of the Indian Museum in Yunnan and in the present part he gives a description of the country in which the collections were made, while Dr. Annandale deals with the sponges and polyzoa brought back from that country.

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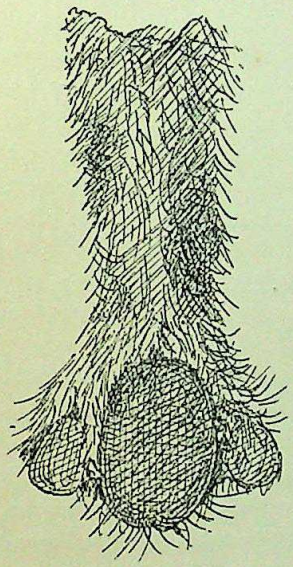
MISCELLANEOUS NOTES.

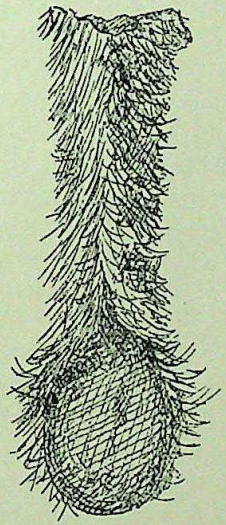
No. I.—HYÆNA WITH DEFORMED FEET.

I have been asked to describe the feet of a striped Hyæna (*Hyæna striata*) which were sent to the Society's Museum by Mr. A. H. A. Simcox, I.C.S., of Jalgaon, E. Khandesh. The animal was a full grown female and judging from the fact that the ends of the bones were not united with the shafts, it is evident that it was a young adult. The feet are deformed and present a remarkable appearance. At first sight they gave rise to the notion that the animal was suffering from some disease akin to leprosy, in which there is atrophy of the fingers and toes. However this idea was seen to be erroneous when it was found that the bones showed no signs of disease.

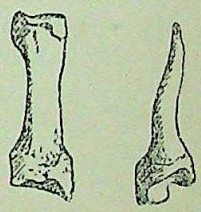
The outward appearance of the feet is shown in the diagrams. There



Fore foot
3 pads.



Hind foot
1 pad.



Normal Abnormal
phalanges of
first row.

are no toes and the claws cannot be seen superficially. The fore feet have 3 pads, the hind feet only one. When examined from the inside, it was found that the claws were present but were buried deep within fissures of the skin. The terminal and middle row of phalangeal bones were missing from all four feet. This constituted the basis of the deformity. The first or proximal row of phalangeal bones were present, but some of these bones

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were malformed, their distal ends tapering to a point instead of ending in an articular knob. Between the ends of these phalanges and the nails were a number of small oval pieces of bone about the size of rice grains which evidently represented the distal phalanges. The metacarpals and metatarsals as well as all other bones were normal.

The deformity of the feet is evidently due to a congenital peculiarity closely resembling the condition known as brachydactyly in Man. Congenital absence of finger bones occurs rarely in Man, but it is known to be heritable in a definite manner. Drinkwater has published an account of an English family in which this peculiarity could be traced through seven generations. The history of this deformed Hyæna is very interesting. Mr. Simcox who sent the specimens makes a special note of the fact that the animal was as active as any other of its kind in spite of its deformity. He mentions specially that he was asked by the villagers to kill the animal in order to put an end to its depredations. According to the selection theory a species is not only brought into being by natural selection but after its arrival is kept constant by the same means; that is to say, it is believed that any individuals which differ appreciably from the type of the species must die out because they are less suited to the circumstances of life than their fellows. But in the case of this hyæna we have an example of an animal which differed very widely from the type and yet seemed to be at no conspicuous disadvantage. We should naturally expect that such an animal would be inactive and able to obtain its food only with difficulty. The history however shows that it met its death because of its activity and boldness.

R. E. LLOYD, CAPT., I.M.S.

CALCUTTA, *September* 1910.

No. II.—PORCUPINES (*HYSTRIX LEUCURA*) FOUND IN THE HILLS.

The question has been asked "are Porcupines found in the Hills?" In my own small place, 55 miles from Simla towards the interior, they are quite common. In 1908 I was at "Shongtong," some 140 miles beyond Simla, when the villagers remarked to me that up till lately they had never seen a Porcupine, but that now they were becoming common.

Looking up the copy of the Society's Journal I find the question raised was with regard to Hedgehogs and not Porcupines. I would ask the editors to let this note stay as it is written, because Porcupines are quite new invaders of the far interior. This on the authority of the natives themselves.

C. E. FENDALL.

SERHAN P. O., BUSSAHIR STATE, SIMLA DISTRICT, *August* 1910.

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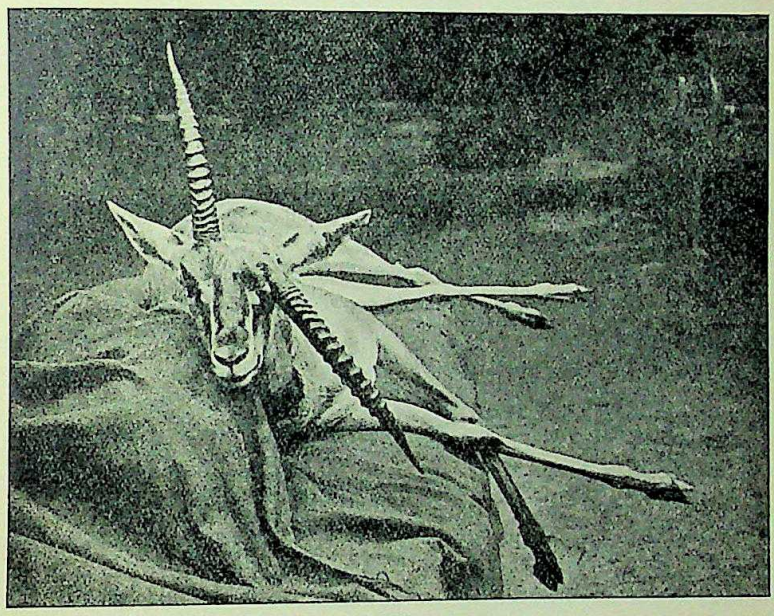
No. III.—AN ABNORMAL CHINKARA HEAD.

(*With an Illustration.*)

Since anything out of the ordinary always attracts notice, I am forwarding photographs of a Chink (*Gazella bennetti*) with an abnormal head which I shot on the 21st August last, not far from a village called Ramaṇia in Kutch. The left horn had grown downwards and had, evidently owing to its pressure, entirely destroyed the animal's eye; the eyelids were also closed



but were quite intact. This horn was not firm at its base and shook a little, but one cannot say at what stage of its growth it had taken the unnatural twist, though I think it probable that it had been injured at its root during its early growth. The right horn measured $11\frac{7}{8}$ inches and the left (abnormal) one $12\frac{3}{8}$ inches and it will be noticed that although the latter had taken a wrong direction, it had still otherwise kept its natural shape. The Chinkara was in good condition.

BHUJ, 30*th September* 1910. R. K.

No. IV.—HARDWICKES HEDGEHOG (*ERINACEUS COLLARIS*) AT FATEHGARH.

I find the following entry in my notes and as it is interesting I send it for record.

At Fatehgarh, U. P., on 18th June 1905, I was brought in a live male specimen of *E. collaris* by my grass-cutter. He got it on the left bank of

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the Ganges while cutting grass. I intended to keep it alive but it escaped during the night. Blanford states (*Fauna of British India—Mammalia*) that it is found as far east as Fatehgarh. As this specimen was obtained across the Ganges it is probable that it ranges further east. Members in the Hardoi district should keep a lookout for it.

H. FULTON, MAJOR.

DEHRA DUN, 1*st November* 1910.

No. V.—KING CROWS AND BUTTERFLIES.

On the 14th instant I was with Mr. C. B. Antram in a very small patch of wood surrounded by grass downs within a few miles of Ootacamund. Running through this wood was a footpath, and this path was in one place a few feet long thickly strewn with the wings of butterflies; and on either side of this for some yards along the path, were scattered wings. Just above this place three drongos (*Dicrurus*) were to be seen on the trees. The weather was during my visit misty, cold and rainy, and hardly any butterflies were on the wing; consequently I had not the opportunity of seeing the birds hawking them. Dragonflies were abundant, and the drongos made frequent excursions after them, all unsuccessful so far as I saw. On examination the wings were found to belong to the following species:—*Danais limniace* (or *septentrionis*, or both), *Danais aglea*, *Danais chrysippus*, *Euplœa core*, *Euplœa coreta*, *Hypolimnas bolina* ♀, and *Catopsilia crocale*. At least 90 per cent. of the wings belonged to *D. limniace* or *septentrionis*. There were several wings of *Euplœa*, amongst which I found those of the males of both *core* and *coreta*. The remaining species were each represented by only one or two wings. These *Danainae* are common in those parts, and in sunny weather would be passing in numbers through and over the wood, and the most common would almost certainly be *limniace*, *septentrionis*, *core* and *coreta*. *D. chrysippus* would be commoner probably on the outskirts of the wood. The only other butterflies about in any numbers when I was there, were *Argynnis castetsi* and *Colias nilgiriensis*, both eminently insects frequenting the open country, and they would seldom or never be found in anything heavier than scrub-jungle. Some of the wings were obviously quite fresh, others had been beaten on the ground by rain. The three drongos were almost the only birds about, and no other birds that we saw were likely to be capable of capturing these butterflies. It appears to me that the drongos were certainly the cause of this extensive shower of wings; the only other possibility is a lizard or mantid; but no lizard, I should imagine, has either the activity or voracity to make away with such a great number of butterflies, even assuming that they settled within its reach. A mantid is even less probable, and I much

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doubt if there is one large enough to tackle *Danainæ* or *Hypolimnas* in the Ootacamund region.

One would not be surprised to find an occasional *Danais* or *Euplæa* sampled by a bird, but to see evidence of a systematic onslaught on butterflies which are so universally looked upon as leaders of the army of distasteful insects, and which are so widely mimicked by numerous "unprotected" butterflies and moths, tends to make one rather sceptical of the accepted theories founded on the alleged value of this distastefulness. It is true that they may disagree with other birds, lizards, etc., but if one enemy alone can effect such wholesale destruction upon them, their immunity from death by violence is so seriously impaired that it seems to me that their numerous imitators amongst the "swallowtails," etc., are simply asking for trouble.

There was no lack of other food for the drongos, and it can only be assumed that they found the *Danainæ* very much to their taste. One can hardly think of a morsel more apparently unpalatable than *Telchinia violæ* yet I saw a bulbul feed its young with one within a few feet of me. It would be interesting if members of the Society would give any evidence in the matter which they can. I have seen the wings of *Hypolimnas misippus* sometimes scattered on the roads near trees in considerable numbers, and on two occasions I have seen the wings of *Charaxes imna*; this I imagine was not caught on the wing; if so, I must congratulate the bird on its powers of flight.

H. LESLIE ANDREWES.

BARWOOD ESTATE, NILGIRIS, 20*th October* 1910.

No. VI.—THE SPOTTED-WING (*PSAROGLOSSA SPILOPTERA*).

Blanford states (*Fauna of British India, Birds*, Vol. I, p. 248), "the Genus *Psaroglossa* contains one bird which has been universally considered a starling, but in my opinion erroneously so. Neither its structure, its habits nor the colour of its eggs show any affinities to the Sturnidæ."

My experience may be interesting, as it tends to confirm the view that the Spotted-wing is a starling in its habits and general appearance.

In March 1910 flights of birds which I took to be *Pastor roseus* could be seen every evening. I did not take much notice of them as I had quite made up my mind that the rose-coloured starling was passing through on migration. Every evening some 400 to 500 birds could be seen at dusk flying exactly like *P. roseus*. They settled in the *tun* trees in the next compound. Every morning at dawn parties of 10 to 15 would pass overhead flying west. I generally saw them therefore too late at night or too early in the morning to be able to see what species they were. But from their flight and general form I was certain that they were *P. roseus*.

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They disappeared for a time but returned in the beginning of June in increased numbers. As I could not understand *P. roseus* being present at that time I decided to secure some specimens. On obtaining the birds I was surprised to find it was not what I expected. However, being certain from its habits and appearance that it was a starling and that I could easily identify it I was further surprised when I found I could not place it in the Sturnidæ. I then tried the Turdidæ but again without success.

The birds remained till 20th June. During that month there must have been between two and three thousand in the flocks. They came in from the west in small flights at dusk and collected in the trees. They would become startled and suddenly a large flock of thousands of birds would be flying at great speed. In a few minutes they would return to settle and their movements and twittering were exactly like those of the rose starling.

On June 18th I was surprised to see them hawking white ants with the drongos and crows.

Rictal bristles are weak. The measurements of some 20 birds agree with those of Blanford. Irides bright yellow, bill horny, yellowish at gape. Legs, feet and claws horny, light horny in the young.

The young bird (*male*) resembles the male more than the female, but wants the chestnut throat of the male. There are distinct shaft streaks on the throat. (I got no young female.)

Locality.—Dehra Dun, height 2,200 feet.

On dissection I found their stomachs full of the berries of a species of *Ficus* (? *religiosa*), white ants and two or three hymenopterous insects.

They would appear to breed in April as the young birds were flighting in the beginning of June.

I forward the skins of a male, female and young male birds for our Museum.

H. FULTON, MAJOR,
2nd K. E. O. Goorkhas.

DEHRA DUN, 3*rd November* 1910.

No. VII.—THE HIMALAYAN GREENFINCH (*HYPACANTHUS SPINOIDES*).

The fact that the Himalayan Greenfinch (*Hypacanthus spinoides*) is a local migrant, appears not to be generally known, but there is no doubt that it is so. These birds are common around the hill stations of Chakrata, Naini Tal and Darjeeling from April till October where they breed between 7,000 and 8,000 feet and probably at similar elevations throughout the outer Himalayan ranges. They nest chiefly in the months of July and August.

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In November they begin to move down the hills and in January and February they may frequently be seen in fairly large flocks of from 10 to 20 or more birds in the plains at the foot of the Himalaya. This is especially the case in Dehra Dun and eastwards through Bijnor as far as Pilibhit. I have no personal knowledge of the plains below Darjeeling, but it is very probable that the Darjeeling birds winter down below like their North-Western brethren.

B. B. OSMASTON.

CAMP, DEHRA DUN, 10*th November* 1910.

No. VIII.—ROLLER CATCHING ITS PREY IN THE WATER.

In reference to a note by your correspondent Major H. Delmé Radcliffe on the "Roller catching its prey in the Water" (*vide* p. 225, Vol. XX, No. 1), I would draw attention to a note by myself in the "*Field*" for 1901 where, as I said, "I saw a roller (*Coracias indica*) hover over the water like a kingfisher. It then plunged headlong in where it remained for a few seconds and then flew off." This occurred in Tirhoot, Bengal. Again, in my little book '*Familiar Indian Birds*,' page 17, referring to this I put forth the following theory:—"The roller is very kingfisher-like in many of its ways, and might not this taste for water have been inherited by a bird whose ancestors descended from kingfisher-like birds?"

GORDON DALGLIESH.

MIDHURST, SUSSEX, 10*th August* 1910.

No. IX.—AN ALBINO HOOPOE (*UPUPA INDICA*).

About the middle of last July, whilst out riding in the vicinity of Ambala Race Course, I noticed a strange looking white bird in the distance. On closer inspection it turned out to be an albino Indian Hoopoe. It was in company with three other ordinary coloured Indian Hoopoes, two of which, along with the white one, appeared to be this year birds, whilst the remaining one was probably the parent bird.

On returning with a gun on the following day, I had no difficulty in finding the specimen in identically the same place and conditions, and in procuring it.

I now send the skin for the Society's Museum. It appears to be an exceptionally complete albino, with pink eyes and even its bill, tarsus and feet are devoid of colour.

Although the Indian Hoopoe is a common enough bird, I have never noticed, or heard of, any trace of albinism occurring amongst them; and

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consequently considered that you might perhaps care to record its occurrence in the Journal.

A. T. BROOKE, R.H.A.

AMBALA, *7th September* 1910.

No. X.—NESTING HABITS OF THE COMMON PARIAH KITE (*MILVUS GOVINDA*).

On page 985 of Volume XIX of the Society's Journal, Mr. Inglis notes on his friend having seen the Brahminy Kite pull twigs off growing trees, while the ordinary kite picks them up from the ground. I have on several occasions, while in Behar, observed the ordinary kite do the same. The method adopted being that it hangs on to the dry twig with its claws and works its wings till the twig comes away.

E. A. D'ABREU, F.Z.S.

KURSEONG, DARJEELING DIST., *5th September* 1910.

[Common kites in Bombay may also at times be seen breaking rotten twigs off trees, but the usual way is for them to take them off the ground.—N. B. K.]

No. XI.—NIDIFICATION OF THE SARUS CRANE (*GRUS ANTIGONE*).

With reference to Capt. A. H. Mosse's note in Journal No. 1, Vol. XX, *re* the Nidification of the Sarus Crane (*Grus antigone*), and also that of Capt. O'Brien's in Vol. XIX, No. 2, it may be interesting to note that I found a nest of this species containing 1 egg on a large jheel about 10 miles from Hardoi, N. W. P., on the 23rd December 1901. The bird left the nest on my approach.

It would appear from these observations that the Sarus Crane is in the habit of breeding after the monsoon.

STANLEY PERSHOUSE,
2nd Border Regiment.

BRADFORD, ENGLAND, *11th August* 1910.

No. XII.—WOODCOCK SHOOTING IN THE NILGIRIS.

The following notes on the Woodcock shooting in the Nilgiris were kindly provided by Mr. Edward Hadfield, one of the oldest shikaris in these hills, who quotes not only from his own experiences but also from the records of his father, the late Major-General Hadfield.

Woodcock invariably arrive on the Nilgiris during the month of October and never has this month gone by without a bird being bagged. The 9th

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of October is the earliest date on which the first bird was seen and killed, but the third week in October is generally the earliest that the first cock is accounted for. The October flight is as a rule very small and the birds that put in an appearance can be numbered on the fingers of one hand.

December and January are the months when cock drop in in larger numbers and by the end of March there is not a bird to come across.

In the early sixties a single gun is known to have bagged 250 cock during the season. At present a sportsman is lucky if he bags from 30 to 40 birds during the same period. This great decrease can only be accounted for by the large herds of cattle that now frequent the plateau which have destroyed all the undergrowth in the sholahs usually frequented by cock and by puddlering the marshy ground whence the birds derived their food.

Early in the season the weight of a cock seldom exceeds 8 ounces; later on they increase in size and from 10 to 12 ounces could be put down as the average weight of a bird. The heaviest bird that has been known to have been killed turned the scale at 14½ ounces and was bagged in March.

The largest bag of Woodcock made by two guns within the last 35 years in one day was 7 couple, all the birds that were flushed having been accounted for. In these days one has to be satisfied if one picks up 3 or 4 cock in the course of a day's shoot.

G. C. LAMBTON, CAPTAIN,

Worcester Regiment.

S. P. M. R., OOTACAMUND, *September* 28*th*, 1910.

No. XIII.—THE LESSER WHITE FRONTED OR DWARF GOOSE ON KABUL RIVER.

I think that perhaps the record of the killing of a Lesser White Fronted Goose (*Anser erythropus*) on the Kabul River here may be of interest to members of the Society. The bird was shot by a friend on 23rd October 1910 a few miles up the river. When first seen it was in the company of a flock of duck.

I identified it from the larger and commoner species by the white on the forehead extending between and just beyond the line of the eyes, and by the size of the bill which measured barely 1·5″ as opposed to the 2″ given for the White Fronted Goose in the *Fauna of India*. I am sending the record, as in the book above referred to, the Lesser White Fronted Goose is described as "a very rare cold weather immigrant to Northern India." I have not heard of any more being shot here.

J. D. G. WIGNALL, LIEUTENANT.

NOWSHERA, N. W. F. P., 1*st November* 1910.

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No. XIV.—DUCKS IN OKHAMANDAL.

The Okhamandal District is a small strip of outlying territory containing the holy city of Dwarka and belonging to the Baroda State, situated on the Kathiawar Coast immediately South of the Runn of Cutch. It is less than 40 miles in length and nowhere extends more than 12 miles inland. The following list of ducks shot in this area by a single gun during the past cold weather (November 1909 to March 1910 inclusive) may be of interest as recording approximately the proportionate abundance of the different species in Western Kathiawar :—

Number.	*Species.*	*Number.*	*Species.*
2	Whistling Teal.	23	Pintail.
16	Mallard.	3	Garganey.
33	Spot-bill.	39	Shoveller.
58	Gadwall.	8	Pochard.
26	Wigeon.	18	White-eye.
72	Common Teal.	5	Tufted Pochard.

Total 303 head.

Perhaps the most interesting item on this list is the Mallard, regarding which it is stated in "*Indian Ducks and their Allies*" that South of the Punjab and Oudh "it is decidedly rare. It has been shot occasionally in Rajputana, and also in the Central Provinces and in Bombay." It has certainly not been rare this season in this district, occurring, though in small numbers, in any suitable place. The Red-Crested Pochard is not included in the above list, as I did not shoot any, but once saw a little party of half-a-dozen of this species.

One piece of flooded land about a mile long and half-a-mile broad held, in March, from 150 to 200 Shovellers. They were scattered in small flocks but the total number struck me as an unusually large one to find of this species in a single place. The shoveller seems in no hurry to depart and undertake family responsibilities; only to-day (1st May) I counted 14 on a small tank. Other belated birds were a dozen common Teal and five or six tufted Pochards on the 17th April.

I do not think there were fewer Pintail than Gadwall in the district; the former's well-known objection to making the acquaintance of the cooking-pot accounts for the smaller proportion in the bag.

A. H. MOSSE, CAPTAIN, S. A.

DWARKA, 1st *May* 1910.

[This note was kept back as it was intended to include it in the Small Game Shooting returns for 1909-10, but owing to so few members having sent in returns it is impossible to publish any information. It is hoped that members will respond more freely at the completion of the present shooting season.—

EDS.]

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No. XV.—DO SMEWS (*MERGUS ALBELLUS*) GO IN PAIRS?

I was looking over some copies of our Journal when I saw the question mooted "Do Smews go in pairs?" Lieut. Francis, from Derajat, says he saw a couple, of which he obtained one. Many years ago in 1880 or thereabouts I was shooting over the Machiwara Jheel near Ludhiana in company with a friend (E. W. T.). Returning one evening to our camp we saw a flock of some white birds on the other side of a small stream that drains the jheel. E. W. T. creeping cautiously up got within range and dropped a bird. Neither of us could identify it until reference was made to "Jerdon" when it proved to be a Smew. There were quite 8 birds in that flock. The time was Xmas week. Up till then I thought Smews were pelagic only.

C. E. FENDALL.

SERAHAN P. O., BUSSAHIR STATE,
SIMLA DISTRICT, *August* 1910.

No. XVI.—THE BRONZE-BACKED TREE SNAKE (*DENDRELAPHIS TRISTIS*) AT BINA, C. P.

A few days ago I killed a Bronze-Backed Tree Snake (*Dendrelaphis tristis*) at Dhaura which is about 2 miles beyond the boundary of the Central Provinces. I think it may be of interest to record this as Major Wall in Vol. XIX, No. 4 of our Journal, says it has not been recorded from Central India nor from the Central Provinces.

I have the specimen in spirit and can send it for identification if necessary.

E. BERNARD COOKE.

BINA, 25*th October* 1910.

[We have seen the specimen which is an example of *D. tristis*. Mr. Cooke has kindly presented it to the Society's Museum.—EDS.]

No. XVII.—EXTENSION OF THE HABITAT OF *LYCODON FASCIATUS*.

On the 25th August 1910, I obtained a specimen of *Lycodon fasciatus*, from the Goomtee Tea Estate near Kurseong, at about an altitude of 4,000 feet.

This snake appears originally to have been recorded from Yunnan and

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recently from Burma and Assam by Majors Wall and Evans. As I am not aware of its being recorded previously from the Darjeeling Himalayas, it might be worthy of record in our Journal and I enclose a description.

The specimen measured 3 feet including the tail which was 8½ inches long. The body was encircled by 52 broad black bands with irregular margin separated by yellowish green intervals; 16 of these band encircled the tail. The black bands were broadest on the neck; the first two failed to encircle the body and the third just did so. The seventh black band and onward were ornamented with irregularly shaped yellow spots which disappeared on the tail. The yellow interspaces were likewise marked with black. Upper parts of head black with a yellow spot on each internasal, præfrontal, præocular, supraocular, loreal, temporal and a spot on the parietal suture. Labials yellowish, the sutures black. The scales were in 17 rows at a point two-head lengths behind the head, at midbody 17 and two head-lengths before the vent 15; the scales were feebly keeled but more pronounced posteriorly. The ventrals were 214, the subcaudals in 98 pairs. Anal entire. One præocular and one postocular on the left while there were two on the right. Supralabials 8, the 3rd, 4th and 5th entering the eye on the left side and only the 3rd and 4th on the right side. The infralabials in contact with the anterior chin-shields were 4 right and 5 left. The anterior chin-shields shorter than the posterior The loreal though tapering to a point anteriorly did not appear to enter the eye.

E. A. D'ABREU, F.Z.S.

KURSEONG, DARJEELING DISTRICT,
5th September 1910.

XVIII.—NOTES ON A BROOD OF YOUNG SEA-SNAKES (*DISTIRA SPIRALIS*, SHAW).

I am indebted to Dr. J. R. Henderson for the opportunity of examining a brood of the Sea-snake *Distira spiralis* (Shaw), variety *typica*. The parent, which is the largest recorded Sea-snake I have any knowledge of, measured 8 feet 3 inches, and on being skinned proved to be gravid containing 14 embryos apparently just ready for discharge. She was captured on the 1st June 1910 in Madras. The Sea-snakes have hitherto proved such a confusing group, and the opinions of herpetologists have been so much at variance with regard to the species, that notes on a brood are of much value.

I have arranged the most important features observed in each in tabular form, as follows:—

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	Sex.	Length.	Ventrals.	Costals.			Labials touching eye.	Marginals.	Rings.		Vertebral Spots.	
				Anterior.	Midbody.	Posterior.			Body.	Tail.	Anterior.	Posterior.
1	♂	11½″	353	28	32	31	3rd & 4th.	1 after 3rd infra-labial.	43	3	In first 9 spaces.	In last 6 spaces, including tail.
2	♂	11¼″	345	29	33	31	Do. ..	2 after 3rd ..	43	4	In first 4 spaces and 6 midbody.	None.
3	♂	11¼″	346	27	31	30	Do. ..	All after 3rd ..	45	4	In first 2 spaces..	8, not in a continuous series.
4	♂	11⅜″	336	27	30	31	Do. ..	1 after 3rd ..	51	4	None	None.
5	♂	11½″	334	28	29	31	Do. ..	2 after 3rd ..	44	3	6th to 9th spaces.	9 continuous.
6	♀	11″	362	30	34	35	3rd, 4th & 5th, the 5th divided.	All after 3rd (R), all after 2nd (L).	43	3	7th to 11th spaces	11 continuous.
7	♂	11¼″	331	28	31	30	3rd & 4th.	2 after 3rd ..	43	5	2nd, 5th and 6th, 10th and 11th and 14th.	3 continuous.

L implies left. R right.

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	Sex.	Length.	Ventrals.	Costals.			Labials touching Eye.	Marginals.	Rings.		Vertebral Spots.	
				Anterior.	Midbody.	Posterior.			Body.	Tail.	Anterior.	Posterior.
8	♂	11½″	341	27	28	30	3rd & 4th.	2 after 3rd ..	41	3	None	7 continuous.
9	♂	11⅜″	328	27	31	32	Do. ..	Do. ..	46	5	1 faint in 1st ..	2 faint in last.
10	♂	10½″	?	26	?	?	?	? ..	46	5	8th, 9th, and 10th.	None.
11	♀	11¼″	370	30	34	36	3rd & 4th.	2 after 3rd ..	42	3	In first 20 spaces..	16 continuous.
12	♀	11″	344	29	33	34	Do. ..	2 after 3rd (R), 1 after 3rd (L).	39	2	1st to 8th, and 11th to 18th.	7 continuous.
13	♂	11¼″	319	28	31	30	Do. ..	2 after 3rd ..	47	4	1 in first	1 supra-anal.
14	♀	10¾″	355 ?	30	35	35	Do. ..	Do. ..	47	5	1st, 8th to 19th ..	3 continuous.
								Parent.				
15	♀	8′-3″	?	?	?	?	?	? ..	45	4	12th, 13th, 20th, 21st.	None.

L implies left. R right.

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It will be seen that the males, all of which had their genitals extended and were therefore easily sexed, considerably outnumbered the females, there being 10 of the former to 4 of the latter.

Sexual differences are apparent. The ♂♂, which measured from 11 to 11½ inches, show a very slight tendency to exceed the ♀♀ in length, the latter ranging from 10¾ to 11¼ inches. Males again usually exhibit a decidedly smaller number of ventrals, these varying from 319 to 353, as compared with 344 to 370 in the females. The number of these shields between the anal and navel is of no account, there being from 23 to 27 in the ♂, and 24 to 25 in the ♀. Females tend to have a larger number of costals in all parts of the body length but especially behind. Anteriorly (2 headslengths behind the head) they number 29 to 30, against the male 27 to 29, in midbody they are 33 to 35 against the male 28 to 33, and posteriorly (2 headslengths before the anus) they are 34 to 36 against the male 30 to 32.

Lepidosis.—All the specimens agreed in having the praefrontal in contact with the 2nd superlabial (except on the left side of No. 14 where it just failed to touch), one praeocular, one postocular, and the posterior sublinguals in contact.

Markings.—The markings of the brood show considerable variation. The rings are mostly of very even width and complete. Some show a slight, and others a more decided tendency for the rings to dilate vertebrally. In some they are discrete ventrally, in others dilated, especially anteriorly, and in others more or less connected by a ventral black band. The vertebral spots that occur in the interspaces are very variable. In one specimen they are quite absent, in another there is one faint spot in front and two faint behind, in others they form a fairly continuous series. In the majority there are no ventral spots in the interspaces, in some these are distinct, and in one the ventral band connecting the rings dilates in each interspace. In all the rings are all or mostly complete, on the other hand in some they are incomplete ventrally, especially behind.

In the parent the rings are not connected ventrally but are interrupted posteriorly, and there are but two vertebral spots.

The differences to be seen in the individuals of this brood are very instructive, and entirely support opinions expressed by me in my monograph of the Sea-snakes* with regard to the two forms *Hydrophis spiralis* (Shaw) and *Distira brugmansi* (Boie), which Boulenger considered distinct.†

In my monograph (page 210) I gave reasons for believing that these two forms were not species distinct from one another. The former was placed in the genus *Hydrophis* by Boulenger on the assumption that the post maxillary teeth are not grooved, whereas in the latter, which he placed as a

* Mem. Asiat. Soc., Bengal, 1909, p. 177 and 178. † Cat. Vol. III.

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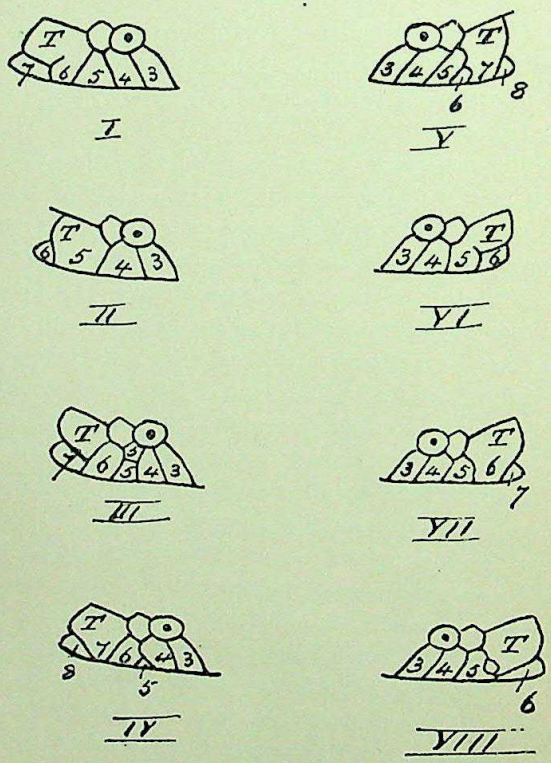
Distira, they are. By the discovery of grooves in these teeth in specimens of the former in the British Museum, the chief reason for considering the two forms distinct was removed, and I went on to show that the only apparent differences that remained, judging from Boulenger's detailed descriptions, affected the number of the supralabials (6 or 7 for *spiralis* and 7 only for *brugmansi*) and ventrals (270 to 334 for *spiralis* and 300 to 354 for *brugmansi*). I remarked that I found specimens labelled *brugmansi* in the British Museum with 6 supralabials, and that the range of ventrals given me for 65 specimens I had examined which I considered alike, was 282 to 373.

As regards markings I showed that there was at least one specimen labelled *brugmansi* in the British Museum with vertebral spots in some of the interspaces, similar to those characteristic of the form labelled *spiralis*.



DISTIRA SPIRALIS.

To show variations in the posterior labials (1 to 8) and temporal (*T*).

An examination of the brood now before me confirms the above stated opinions, for it will be seen (1) that the supralabials are variable, (2) the

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ventrals range from 319 to 370, and (3) whilst some specimens have many vertebral spots, one at least has none at all, and another a single faint one anteriorly and two behind.

It seems to me absolutely conclusive that *spiralis* and *brugmansi* should be considered a single species for which the former name having precedence should hold.

Another opinion expressed by me in my monograph* is that individuals of the same species show so much variation in the number and disposition of the supralabial and temporal shields that with few exceptions these shields are of very dubious, if any, value in assisting the classification of the group. Reference to the figures I append taken from the brood before me strongly support this statement.

I think it is obvious in figures I and VI that the temporal is confluent with a subjacent labial, but even in figures II and VII, I think it better to record the condition as (figure II) supralabials 6th, 5th confluent with temporal, and (figure VII) supralabials 7, 6th confluent with temporal, instead of saying temporal reaching labial margin, and not including this shield in the supralabial series, as some authors do.

A careful search for the fœtal tooth in these specimens was unavailing.

I take this opportunity of appealing to those members of our Society residing on our coasts, to send any specimens of gravid sea-snakes to our Secretary. The study of a brood may lead to most important conclusions, and may materially reduce the difficulty in classifying the group.

F. WALL, C.M.Z.S., MAJOR, I.M.S.

CHITRAL, 18*th August* 1910.

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* Loc. Cit., p 178.

No. XIX.—KRAIT AND LANDRIA (*D. TRIGONATUS*).

I send you two snakes which were the actors in a grim tragedy on October 21st, 1910, at the Residency, Bhuj. The one I have little hesitation in calling the Common Krait (Cutchi-*Padamnag*) as it seems to tally with Major Wall's description. It is not full grown, being 31 inches only. The other yellowish-green with coffin-shaped head and white semi belts edged with black scales down its back is called *Landoria* by some Deccani and Konkani sepoys. H. H. the Maharao Sahib says its Sindhi name is *Landria*, and Cutchi *Kodia*. We have usually considered this to be the Phoorsa, but it does not seem to be scientifically correct to do so for it appears to differ largely from the *Echis carinata* of Major Wall's book. This snake measures 38½ inches.

At 7 a. m. Col. H. M. Abud, the Resident in Cutch, found the Landria hanging by a twist in its tail to a twig of the bougainvillia growing over his porch. Hanging on to its head was the krait, the krait having the

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landria's head in its mouth. The landria was struggling violently to shake off its foe, so much so that its own hold of the twig slipped and it fell with its tail still knotted. The krait edged backwards dragging the still struggling landria half way up a small bank sloping to the Residency wall. When I arrived at about 7-15 the landria's struggles were getting faint and they ceased altogether before long. The krait was meanwhile gradually swallowing the landria; it was slow work. We noted the time taken between the engulfing of two white spots about an inch apart; it took 3¾ minutes. It was a puzzle to us to guess what would happen later on, for the landria was the longer reptile and it was not likely that its head would get much beyond the krait's middle without serious consequences to the krait, the more so as the twist in the landria's hind-quarters would have to be negotiated. One of the servants, Uka Bhil, suggested that the krait would probably bite off the end part of the landria and thus avoid the difficulty. He had seen a big snake do that to a small fellow before.

The krait's progress grew slower as it reached the more swollen part of the landria. For quite an hour the latter had been motionless and we thought it must be dead; but suddenly it began to give spasmodic twitches and wriggles.

For two and three-quarter hours the struggle had been going on and we computed that 18 inches of the landria were still outside though the twist in the tail which had in the struggle worked upwards to a higher point, made accuracy impossible. The krait then gave some violent twitches and elevated his upper jaw almost perpendicularly and began to disgorge slowly at first, then rapidly drawing himself back in order to do so, in a few seconds he was clear and back in his normal dimensions. He proceeded to make off, but seeing people about, he lay under shelter of a flower pot and was then despatched.

The landria seemed unharmed in body except for glazed eyes, distorted jaw, frayed scales and the broken part in his midbody.

The landria was still living. Uka Bhil says the landria lives in roofs and trees; the krait in holes in the ground. The scene was witnessed by H. H. the Maharao, Col. H. M. Abud, M. N. S. Vijayarajji and myself besides numerous servants.

J. H. SMITH.

[The Landria proved to be the Common brown Tree Snake (*Dipsadomorphus trigonatus*). The Kraits are well known to feed on other snakes and frequently are found in the roofs of houses.—EDS.]

No. XX.—CASE OF SNAKE BITE FROM HIMALAYAN VIPER.

Having read several letters in the Journal about snake bite, I send you a few notes on a case which I was called on to treat last August, hoping they may prove of interest. About 9 a.m. on 24th August 1910 the

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sweeper of the Cantonment Hospital, Chietoo by name, was brought to me and stated that he had been bitten by a snake about 8-30 a.m. whilst he was cutting grass. He had two pairs of small incisions on the left index finger, there was considerable swelling of the finger and back of the hand. He had been to see the mali at the Station Hospital as he said he could cure snake-bite, however the Hospital Assistant thought otherwise and brought him to me. A tight ligature was placed round the wrist, both bites were deeply incised, crystals of permanganate of potash rubbed in, and two tubes each containing 20 c. c. of antivenine were injected into his forearm by Capt. W. R. Galway, R.A.M.C., and myself. Whilst the injections were being given the man collapsed. His pulse being very rapid and running, his body profusely wetted by a cold sweat. There was no vomiting or diarrhœa. The man was put to bed and when seen in the afternoon stated he felt fairly well except for severe burning pain in the left arm. His evening temperature was 100·6, next morning it was normal, after this his progress was satisfactory and in three days he returned to duty. I enclose the skin of the snake which is, I think, a common hill Viper of which I have caught several specimens.

J. E. M. BOYD, CAPT., R.A.M.C.

SILVERTON, DALHOUSIE, 25*th October* 1910.

[The skin is that of a Himalayan Viper *Ancistrodon himalayanus*.—EDS.]

No. XXI.—THE FOOD OF A BULL-FROG.

One of the most interesting facts of animal life is the variety of measures adopted by animals to ward off their enemies. The familiar Bag-worm or Lictor-insect, the caterpillar of a Psychid moth which forms a case of Babool spines bound close together like the fasces of the Lictors of ancient Rome, may be supposed to have hit upon an effective plan to protect itself, but one was discovered within the stomach of a frog which I dissected at the Poona Agricultural College before half a dozen persons. The spines were about three-fourths of an inch in length with the sharp points intact. The frog was a good sized female and besides the Psychid larva there were several small fresh-water shrimps.

H. M. CHIBBER.

AGRICULTURAL COLLEGE, POONA, *October* 1910.

No. XXII.—FISHING IN BURMA.

With regard to Mr. Adam's query in Miscellaneous Note No. XXII in Vol. X, No. 2, of the Journal, as to the Burmese name for the mahsir :—the boatmen I have employed while fishing in the Irrawady in the neighbourhood of Myitkyina use the names Nga Shu, Nga Dauk and Nga Ni for the

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three kinds commonly caught by anglers in that part of the river. The Nga Shu is a long fish with a long head, a large and very telescopic mouth and heavy shoulder; all the fish over 30 lbs. in weight that I have caught or seen belonged to this variety. The Nga Dauk is a thicker, deeper fish than the last and has a comparatively small head and mouth. The Nga Ni on leaving the water is as red as a boiled lobster except on the belly, which is white. I have heard it said that the Nga Ni is the male of the Nga Dauk, I do not know with what truth; I have found it to be much more 'overhung' than either of the other varieties and to take a spoon less frequently, from which one may perhaps infer that it is more of a bottom feeder. I once saw a large shoal of red fish ascending a small river just before the rains. I do not know if mahsir migrate in shoals of one sex or in mixed parties.

J. H. WHITEHEAD, MAJOR.

S. S. "STAFFORDSHIRE," *5th November* 1910.

No. XXIII.—*ARGYNNIS HYPERBIUS*, VAR. *CASTETSI*: AN APPEAL.

I am asking for the co-operation of entomologists in S. India to assist me in investigating the area and distribution (including elevation) of the dimorphic female of *Argynnis hyperbius* form *castetsi*, more particularly that form which is without the purple apex and white subapical band which is so distinctive of *castetsi*. My reason for asking assistance is to throw further light on the evolution of the *Argynnidæ*.

Dr. F. A. Dixey, F.R.S., in his classical paper, "On the phylogenetic significance of the wing markings in certain genera of the Nymphalidæ" Trans., Ent. Soc., London, 1890, gives his reasons for the view that the wing markings of the *Vanessidæ* have been derived from an ancestor with wing markings very distinctive of the *Argynnidæ*, and further that the dark females of many *Argynnidæ* retain the ancestral features of that family.

He shows that this is most marked in the North American species *A. diana*, which is almost entirely of a deep blue black colour, and well marked also in the Chinese species *A. sagana*, which has the male very similar to *A. hyperbius* but the female of a dull uniform brown with a white subapical band. These ancestral features are less clearly shown in the European *A. pandora* which has the wings, more particularly the bases, olive-green, and in the form *A. valezina* the dimorph of *A. paphia*, which is found not uncommonly in the New Forest. In India *A. hyperbius* female retains the dark colouring. But at the time Dr. Dixey wrote his paper he was unaware that in S. India this species has a dimorphic female, the one representing the ancestral type (*castetsi*), the other (*martini??*) representing the newer development, *i.e.*, by more closely resembling the male. The

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interest attaching to these insects is therefore manifest. *Martini* is, I believe, a high range insect; it certainly does not occur at Coonoor where *A. castetsi* is common, and which I have bred freely. I should be extremely grateful to entomologists residing, or who have collected, in these localities for any information they can send me. I should wish for a large number of specimens from various localities to ascertain whether the two forms show any intermediate features. It is a species quite easy to breed; and for this purpose a fresh, not a worn, female should be captured and placed under muslin over a pot of wild or garden pansies (they will *not* feed on the common violet) with a slice of orange soaked in sugar and water, or for that matter any available fruit will do.

The usual habit of butterflies is to lay a few eggs, go off and feed and then lay again and much disappointment may be avoided by enabling the captive to feed freely. The whole of the brood should be kept. I hope to publish the results at a future date.

N. MANDERS, LIEUT.-COLONEL, F. Z. S.

COLOMBO, CEYLON, 1*st November* 1910.

[*Argynnis hyperbius*, var. *castetsi*, was described by Oberthür in 1889.—EDS.]

No. XXIV.—NOTES ON *COLOTIS* IN SIND.

No less than six forms of the genus *Colotis* are found in Sind: *Colotis amata, Colotis protractus, Colotis vestalis, Colotis fausta, Colotis etrida* and *Colotis danæ*. Of these the first three are invariably found in close association and not uncommonly all six may be taken in one small area. All down the lower basin of the Indus, in the extensive acaciæ forests which line its banks, the first three of the above list, literally swarm in hundreds and this for practically the whole year round. *Colotis etrida* may be found anywhere and at any time of the year; *Colotis danæ* and *fausta* only appear in August and September, the latter appearing to be comparatively uncommon. In July of this year, I took *C. amata* and *C. vestalis in cop*, a female of the former being connected with a male of the latter. A week later I again saw these two in connection, the same sexes respectively being engaged and on the same day I netted and bottled a male *protractus in cop* with a female *amata*. All three pairs were killed without causing separation so that I was able to satisfy myself as to the forms and sexes engaged. Since then I have time and again seen these three forms breeding thus promiscuously. Unfortunately I have not so far been able to obtain eggs from a female thus impregnated so am unable to say what the resulting hybrids would appear like. I find that eggs laid by the typical forms breed true, this being the conclusion I arrived at after breeding from the egg some hundreds of all three forms. No difficulty was met with

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in collecting the eggs of *C. amata* as it lays its eggs in large batches of five to as many as forty; *C. protractus* and *vestalis* on the other hand always lay singly so that specimens had to be followed round patiently until a dozen or so eggs had been secured, after which the parent would be netted, killed and laid aside to compare with the children when they finally emerged from the pupa. *Amata* differs from all other forms of its genus, in thus laying its eggs in batches and as one would suspect, the resultant larvæ are gregarious. The larvæ of all other forms feed singly. Although *C. protractus* and *vestalis* are often seen *in cop* with *C. amata* yet curiously enough the two former have never been seen by me in connection. The affinities between the two is so close and on the other hand both diverge so widely from *amata* that one would suspect a different state of affairs. On the wing I have taken a female *vestalis* with the discal and juxta-discal areas beautifully suffused with the salmon-buff colour of *protractus* and this I regard as a hybrid of these two forms, although, as I have already mentioned above, I have never seen them *in cop*. I have another form of *C. protractus* in which the salmon-buff ground colour is almost entirely replaced by the creamy white of *vestalis* and this too may be regarded as a hybrid between the same forms. All three forms show wide variations, in fact a whole series may be obtained of such. *Colotis* is pre-eminently noted for the extreme variations which are seen amongst its various forms and these are rightly ascribed to influences of climate, temperature and perhaps food, it may be, however, that hybridism plays a greater part than hitherto suspected.

I append a description of the larvæ of *C. protractus* and *vestalis* as I believe they have not hitherto been described.

C. protractus.—Ovum pure white, ampulliform in shape, strongly ribbed. Hatch out on the third day.

Larva.—Grass green, at first a crimson stippling along the sides but this gradually fades in successive moults until finally lost in the last. The final skin has a peppering of white minute dots and tiny bristles covering the skin. There is a white dorsal line along the back which may or may not have a yellow edging. In shape, cylindrical like that of *T. hecabe*. This larva is interesting in that it is the only one of its genus (so far as the Indian forms are concerned) that has not got a black head when first emerging from the ovum.

Pupa.—Creamy, flesh-coloured or pale green with no markings; body stout, with a stunted point at the head. Suspended upright by waist-belt and anal attachments.

C. vestalis.—Ovum pure white, ampulliform in shape, strongly ribbed. Hatching on the third day.

Larva.—First skin bears a shiny, jet-black head, body grass-green with crimson-stippling latterly which in the posterior three segments spreads

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upwards and meets that of the opposite side, so as to form a more or less prominent crimson patch. This stippling fades during successive moults and is entirely lost after the last. The black colour of the head gradually passes off also; after the first moult, it is present as a black crown to the green head, this crown grows smaller and is entirely lost after the final moult. The final skin is identical with that of *protractus*; when mixing the two together I have been quite unable to say which was *vestalis* and which *protractus*.

Pupa identical with that of *protractus*, usually flesh-coloured and without markings.

The larvæ of the whole of this genus, so far as the Indian forms are concerned, bear characteristic bristles. These are seen to perfection in *C. etrida* and in the early skins of all. Under a high power of the microscope, an individual bristle is seen to be mounted on a whitish, nipple-like process and to bear a transparent club or bead at its free end. Under certain lights this bead is highly refractive and often gives off a brilliant gleam like the glow of red-hot charcoal. The bristles are six in number on each segment, arranged in an unequal-sided sexagon. The two anterior are placed close to either side of the dorsal line, the two medial, well down the sides, the two posterior not quite so near the median dorsal line as the anterior pair. A similar arrangement is met with throughout all the larvæ of this genus and forms a most important binding link for purposes of classification. In *protractus* the beads are often lost after the final moult but the bristles persist; in *etrida* they are seen to perfection after the final moult.

Lately being interested to see this characteristic spread to the allied genus, I examined the larva of *T. hecabe* and find that the same bristles with the same arrangement is to be seen in it, the only difference being that the major bristles are reinforced by a host of smaller ones which do not however hide the arrangement of the former.

F. C. FRASER, CAPT., I.M.S.

HYDERABAD, SIND, *September* 1910.

No. XXV.—THE OCCURRENCE OF *ATELLA ALCIPPE*, CRAMER, IN NORTH MALABAR.

Mr. T. R. Bell describes this species as occurring very locally in North Canara and as having been obtained recently in Travancore. Whilst in North Malabar I went twice up what is known as the Tambracheri ghat, between Pudupadi and Lakkadi, in April and noticed considerable numbers of this species flying about. On a third occasion I took my net and captured as many specimens as I required. At the foot of the ghat (about 500 feet) it was comparatively scarce but from about 1,000 to 2,000 feet

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elevation I saw them literally by hundreds. There are some peculiar little marshes here and there on the ghat covered with grass or sedge of a particularly dark green colour, and as the butterflies were hovering over these in large numbers, I imagined that the food plant was to be found there.

The rainfall on this ghat is particularly heavy and, on the only other occasions I had of traversing the ghat, there was so much rain that no self-respecting butterfly would have shewn itself. I have not seen this species anywhere else either in Malabar or in the Anaimalai Hills of Coimbatore.

P. M. LUSHINGTON, I.F.S.

COIMBATORE, 27*th October* 1910.

No. XXVI.—FOOD PLANTS OF *ATELLA PHALANTHA*.

Mr. Bell in his paper in the last issue of the Journal gives the food plants of *Atella phalantha* as all belonging "as far as is known" to the genus *Flacourtia*. I have bred it from larvæ found on *Salix tetrasperma*, Roxb. The young shoots of this tree in swamps here are almost defoliated by it in spring, and the butterflies may be seen in scores flying round the lower branches and laying their eggs.

H. LESLIE ANDREWES.

BARWOOD ESTATE, NILGIRIS, 20*th October* 1910.

No. XXVII.—LARVA OF *VANESSA INDICA*.

On page 282 of the last number of this Journal (Vol. XX, No. 2), the author of the paper on "Common Butterflies of the Plains of India," speaking of *Vanessa indica*, remarks:—"This butterfly has not been bred as far as is known."

I have repeatedly reared *Vanessa indica*, in Ceylon, from larvæ feeding upon the foliage of the large "Nilgiri Nettle" (*Girardinia heterophylla* var. *palmata*). Moore also, in the "Lepidoptera of Ceylon," records its food plant as *Urtica neilgherriensis*, which is presumably a synonym of the same plant.

The larva has habits similar to those of its European relative, spinning the edges of a leaf together and resting within the shelter so formed. It frequently pupates within the larval shelter. In appearance the larva is very like that of *atalanta*, but is usually rather darker.

The Nilgiri Nettle is a formidable plant. Its stinging spines are long and sharp, and can penetrate ordinary clothing without any difficulty. The sting is very painful at the time, but its unpleasant effects pass off more rapidly than do those of the common European nettle.

E. ERNEST GREEN.

PERADENIYA, CEYLON, 26*th October* 1910.

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No. XXVIII.—BUTTERFLIES OF THE KONKAN.

By the time this note is published in the Journal most residents of Bombay will probably have forgotten the heavy downpour of rain in the forenoon of Sunday, 21st August 1910. Let it suffice therefore to say that for an hour or so it was coming down about as hard as it could. At the time it set in, I was in a steam launch with a friend lying off Sunk Rock lighthouse in Bombay harbour with the intention of angling for our local sporting fish, the Ravas (*Polynemus plebeicus*). The wind was blowing fresh from W. N. W. Such are hardly the conditions or locality to encourage one to anticipate observations on butterflies worth recording. In the thick of the storm however and evidently with the hope of obtaining shelter, two specimens hovered round the launch which I have never previously observed in Bombay Island. The first was an *Arhopala*, presumably *amantes*, and apparently a more or less perfect specimen. The species is however known in the hilly jungles of Thana and Colaba Districts. Presently there appeared a large and very battered butterfly that at once attracted my attention as a stranger. It settled on the launch and I was then able to recognise it as *Parthenos virens*. I tried to catch it in order to establish its identity beyond all question of doubt, but it was restless and I failed. It is not however a species there is any difficulty in recognising. This species inhabits southern India as far north as Kanara and in our Journal (Vol. XV., p. 48) Mr. E. H. Aitken and I recorded that he had once seen it at Vingorla.

E. COMBER.

BOMBAY, 28*th August* 1910.

No. XXIX.—BUTTERFLIES OF KUMAUN.—ADDENDUM.

372. **Parnassius epaphus,** *Oberthür.*

Two males were brought in by a native catcher who accompanied Mr. S. L. Whymper to the Niti Pass in June 1909, presumably taken at about 14,000 ft.

In size and markings they resemble very closely race *sikhimensis*, Elwes, as figured by Bingham (Vol. II., pl. XV); the two distal crimson spots on the upperside of the forewing are, however, larger and fused into a short bar. They have no resemblance to the forms *nirius* or *cachemirensis* as figured by Dr. Seitz (Macrolepidoptera Palaearctica, plate 15).

HESPERIIDÆ.

373. **Pamphila avanti,** *Moore.* A single male from the Niti Pass, 15,000 feet, in July.

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ERRATA.

In Part II of this paper (No. 2, Vol. XX), the following *errata* occurred :—

Page 363, No. 193 for **Synchlœ**....*Euchlœ* read **Synchlœ**....*Euchlœ*.
„ 364, „ 213 for *pubella* read *rubella*.
„ 364, „ 224 for **lains** read **laius.**
„ 365, „ 237 for **lalmora** read **zalmora.**
„ 367, „ 273 for *L. liba* read *Z. ziha* and '*Z*' for '*L*' as the generic initial throughout.
„ 370, „ 315 for **Rupala** read **Rapala.**
„ 370, „ 332 for 24,000 *ft.* read 2,400 *ft.*
„ 371, „ 339 for **angiades** read **augiades.**
„ 371, „ 354 insert **syricthus** after **Caprona.**

F. HANNYNGTON.

FELPHAM, SUSSEX, *September* 1910.

No. XXX.—NOTES ON LIFE HISTORY OF *VANESSA INDICA* AND *KASHMIRENSIS.*

Larvæ.—Found between 1st and 7th May 1908 feeding on the large Himalayan nettle near Naini Tal at 7,000 feet.

(Larvæ of *V. kashmirensis,* found at the same time and elevation, were all feeding on the common nettle (*U. dioica*).

When young the larva is reddish black with black spines and pale yellow sub-spiracular line. At the second moult, the spines on 2nd and 3rd segments are yellow and at the third moult the spines assume the pale lemon-yellow tint of the full grown larva. The spines on the head and subspiracular line are lemon-yellow throughout life.

The legs are black, the claspers and ventral surface pale-yellow. Larva sluggish in habits and rolls in a ball when disturbed.

Pupa.—Identical in shape with that of *V. atalanta,* but much darker in colour. Wing-cases dull smoky green. Body brownish green with whitish stripe down spiracles. Anterior thoracic protuberance and 12 ventral spines tipped with golden bronze. Pupal state lasted from 10 to 12 days; the first butterfly hatching out on 21st May 1908.

Imago.—The butterfly is apparently double-brooded in Kumaun, the second brood appearing in September and hibernating.

Vanessa kashmirensis.

Eggs.—Laid early in April, larvæ appeared on 20th April 1908, and were full fed on 7th May 1908. Butterflies hatched out between 20th and 30th May 1908.

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Two of the pupæ failed to hatch out and, on examination, the entire pupal case was found to be occupied by a large white grub which apparently developed after the change to pupa instead of hatching out from the full-fed larvæ. In habits and appearance larvæ and pupæ almost exactly similar to those of *V. urticæ*.

F. HANNYNGTON.

RICHMOND, S. W., 16*th November* 1910.

No. XXXI.—SOME BUTTERFLIES TAKEN AT FATEHGARH.

As records of the distribution of species are often of interest I append a list of butterflies taken by me in a garden at Fatehgarh during portions of 1908 and 1909, *Lycænidæ* and *Hesperiidæ* being omitted for want of identification.

1. *Danais plexippus*, Linn.—Common.

2. *Danais chrysippus*, Linn.—Very common. Seemingly not distasteful to mantis as I saw a mantis devouring one, and it only discarded the remains when it had eaten all the body.

3. *Danais limniace*, Cramer.—Fairly common.

4. *Euplœa core*, Cramer.—Common in rains.

Although oleander plants were numerous in the garden, probably some more attractive food-plant was there too, as I never found any larvæ or pupæ nor any of the butterflies about the oleanders though I often searched; whereas in a garden in the Central Provinces some years ago where there were few oleanders I found both larvæ and pupæ on them, and saw the butterflies depositing eggs on the underside of the leaves.

5. *Euplœa mulciber*, Bingham.—Two ♂♂ and one ♀ taken in the rains.

6. *Mycalesis perseus*.—Fairly common.

7. *Melanitis ismene*.—Very common in the rains, but much less in evidence during the dry season.

8. *Junonia lemonias*.—Common.

9. *Junonia orithya*.—Fairly common.

10. *Junonia hierta*.—A few taken.

11. *Junonia almana*.—Several taken.

12. *Vanessa cardui*.—One taken.

13. *Hypolimnas bolina*.—Common. At several places about the garden males took up each his position and drove away all intruders.

14. *Hypolimnas misippus*.—Common.

The '*dorippus*' variety and some intermediate between it and the ordinary form of the ♀ were taken, though I did not there meet with the '*dorippus*' variety of *D. chrysippus*.

15. *Atella phalantha*.—Common in the rains.

16. *Argynnis hyperbius*.—Common.

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17. *Cirrochroa mithila.*—Two of each sex taken and one more of each seen. The wings of this species seem to be very brittle.

On page 644 of Vol. XIX of the Journal, "was taken at Lucknow" seems to imply this to be the only record so far of the capture of this species in the plains. So the taking of four specimens and two more being seen at Fatehgarh would seem worth recording.

18. *Telchinia viola.*—Three taken.

19. *Abisara echerius.*—One taken.

20. *Papilio aristolochia.*—Very common in November.

21. *Papilio demoleus.*—Abundant.

22. *Papilio polytes.*—Common. '*cyrus*' form, two ♂ ♂ taken. One '*romulus*' ♀ taken, another seen.

23. *Papilio clytia.*—One worn specimen taken in August. '*dissimilis*' form fairly common.

24. *Delias eucharis.*—Abundant, especially in October.

25. *Anaphœis mesentina.*—Abundant in November.

26. *Pieris brassicæ.*—Common in early spring.

27. *Huphina nerissa.*—Common.

28. *Ixias pyrene.*—One taken and another seen.

29. *Ixias marianne.*—Very common.

30. *Appias hippo.*—One taken in July.

31. *Appias lalage.*—One ♀ taken in the hand 1st December 1909.

32. *Appias albina.*—Two ♀ ♀ and one ♂ taken, and a few others seen.

33. *Catopsilia crocale.*—In the dry season var. *catilla* only was met with and was fairly common; in the rains both *crocale* and var. *catilla* very common in company, the latter in greater number.

34. *Catopsilia pyranthe.*—Very common.

35. *Catopsilia florella.*—Very common, especially in the autumn.

36. *Colias croceus*, var. *fieldi.*—One ♂ taken.

37. *Terias venata.*—Very common in August.

38. *Terias libythea.*—Very common in August.

39. *Terias laeta.*—Not common.

40. *Terias hecabe.*—Very common.

41. *Colotis amata.*—Two males taken.

42. *Colotis etrida.*—Fairly common.

43. *Pareronia hippia.*—Three ♂ ♂ and two ♀ ♀ taken in October and November.

While on the subject of butterflies I may mention that on August 11, on a Hampshire moor, I came upon a Peacock butterfly (*V. io*) adherent by one hindwing to a leaf of the round leaved sun-dew. It seemed to have been struggling for a considerable time, as the scales were rubbed off some of the veins, and the hairs of the leaf were already turned inwards securing their hold upon the wing. The butterfly was otherwise in perfect condition,

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being the first seen by me of this season's brood, and seems a large insect to be securely held by so small a plant.

I also saw a white admiral become entangled in a web, and the spider rush upon the butterfly to secure it. But the spider was deprived of this 'bonne bouche' by a hand quickly but gently releasing the victim, for the white admiral is now very local in England.

A large tortoise-shell (*V. polychloros*) taken on August 12, has well marked blue lunules on the forewings, which is unusual and due perhaps in this case, as mentioned by South, to the very cold summer this year in England.

August 1910. H. D. PEILE.

No. XXXII.—NOTES ON LIFE HISTORY OF *PAPILIO RAVANA*, MOORE.

Larva semi-gregarious found feeding on *Aristolochia sp.* at 8,000 ft. on Lirnja Kanta near Naini Tal on 25th July 1909.

Description. Cylindrical, tapering slightly towards each end. Ground colour varies from dark grey to creamy white marbled with oblique blackish lines. Two lateral and two sub-dorsal rows of fleshy tubercles with an additional pair on segments 3 and 4, the subdorsal pair on segment 2 elongate, giving the appearance of horns; all the tubercles black tipped with red except on segments 7, 8 and 11 on which they are creamy white, which colour on segments 7 and 8 is continued obliquely over almost entire segment forming a jagged white patch; segmental incisions dull brown. The black on the subdorsal tubercles forms two interrupted lines between which is a dorsal row of blackish spots.

Head naked, shining black or in the lighter specimens, dark brown; clypeus divided from lobes by a prominent yellow line; legs black, claspers velvety brown, anal claspers tipped with red, ormeterium orange.

Pupa.—Carinate, stout and laterally dilated. Greenish yellow with lilacine stripes, head truncate, an orange protuberance on back of thorax which is dorsally conical. Each abdominal segment with a pair of prominent tubercles on the back.

The first larva to pupate was one found already spun up on a twig of *Viburnum* close to the good plant with little or no attempt at concealment. This remained quiescent for 48 hours before pupating and the interval between spinning up and pupating was generally 3 days. Like all the known pupæ of this group, this species attached itself vertically with a black silken body band and an anal pad. By 6th August 1909 all had been spun up. First butterfly appeared on 20th April 1910.

F. HANNYNGTON.

FELPHAM, SUSSEX, 10*th May* 1910.

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No. XXXIII.—HAWK-MOTH AND SPIDER.

I have this moment witnessed the following occurrence in my garden. Probably it is a common one but on the chance of it being worth recording, I describe it. I was watching a bee-hawk moth, with clear wings, darting about over a bed of zinnias. As it hung over one flower it suddenly was caught as if in a trap, and beat its wings violently. I took it by one wing, put it in the palm of my hand, where, in a moment or two, it died. I then looked at the zinnia, and found squatting on it a lemon-coloured spider with a triangular body and long yellow legs. I lowered the dead moth near it when the spider caught at it with its fore legs, pulled it down, buried its face in the moth's chest, and doubtless started sucking the moth's juices. The amazing thing was the strength of the spider in comparison to its small size.

It had a smaller brownish spider on its back. Everyone knows what a vigorous creature the hawk-moth is. This was a very fine specimen, yet in under 15 seconds it was moribund.

The spider was on one of those virulent mauve zinnias and there was no effect whatever of any protective coloration.

C. G. C. TRENCH, I.C.S.

DAMOH, C.P., 30*th July* 1910.

No. XXXIV.—THE FOOD OF DRAGON-FLIES.

I have on many occasions seen, in New Zealand, dragon-flies catch cicadas. The cicadas were generally caught when on the wing though sometimes when on the trees. These insects (cicadas) are very common in the *ti-tree* scrub and especially so near water. They are one to one and a half inches in length.

The dragon-flies appeared to hold the cicadas between the two front pairs of legs, and were able to continue their flight with the cicadas though the latter appeared to be a great deal heavier than the dragon-flies.

On 12th October 1910 while shooting in the Lissoo Nallah, Naoboog District, Kashmir, I watched with interest a dragon-fly try to catch what appeared to be a small may-fly about ½ inch long. I got a good view as the sun was setting, the insects almost between me and the sun with a dark back ground of cedars.

The dragon-fly swooped down like a king crow on a moth, missed, turned and tried again.

This was done five or six times and every time at the same may-fly though three may-flies were within three or four inches of each other.

The dragon-fly eventually gave up the chase.

DEHRA DUN,
3rd November 1910.

H. FULTON, MAJOR,
2ND K.E.O., GOORKHAS.

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No. XXXV.—AN ANT GRANARY.

During the month of June very heavy and continuous rain fell for two whole days. At its termination, the weather cleared and hot sun-shine was recorded. On the morning that the weather cleared, the food contractor, who keeps a large store-yard in the Jail here—Hyderabad, Sind—reported to me that some prisoners had stolen a large quantity of grain from the godown and had maliciously thrown it about the yard. On going to see into the matter myself, I found a series of twenty or more heaps of grain in various parts of the yard. I at once noticed that each heap was crateriform in shape and that from the crater of each, a large number of black ants were issuing. Stooping over one of these heaps, the phenomenon was soon explained; each ant was carrying in its jaws a single grain of corn which it bore to the lip of the crater and hurriedly depositing it there, returned to the central hole for another load. I gave orders that the grain, which I observed to be made up entirely of bajri, was to be gathered up and weighed and was not a little astonished to find the total came to three maunds (240 lbs.). In the godown, sacks of wheat, jowari and bajri are stored; why then was only the bajri stolen? The explanation is simple. The first two grains are too large and cumbersome to be taken away without excessive labour whereas the bajri grain is of a size, nicely adapted to form a single load for each ant. What extraordinary economy of labour and what industry and providence? The grain had never been missed; no shortage had ever been noticed. The theft of the grain had gone on insidiously through the long months of drought; borne by devious underground highways and bye-ways to numerous chota granaries, there to afford ample food for the community of the ant-kingdom. Bye and bye comes the rain and soaking down, floods the granaries. The extraordinary sagacity of the ant tells him that unless he can quickly dry his stores, the grains will sprout and the whole be lost. Perchance the grain did begin to swell in the heated, moist ground and the pressure in the granaries and underground channels threatened to annihilate many of the community. Either of these two reasons prompted the ant to rush his stores above ground and to lay them in the sun to dry again. That this stupendous task was urgently called for, was clearly proved as I noticed most of the grain was already bursting. Incidentally an interesting legal question arose out of this. A new contractor had just come on and claimed the grain. I pointed out that the grain must have been stolen during the late contractor's regnum and was therefore really his. The dispute is still undecided, meanwhile I conjecture the ant quite undisturbed by the pettiness of human affairs, still stealthily "creeps in and carries off another grain of corn."

HYDERABAD, SIND, F. C. FRASER, CAPT., I.M.S.

11*th August* 1910.

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No. XXXVI.—THE FOOD OF A MANTIS.

The other evening my attention was drawn to a mantis on the wall of my tent which had caught a cricket. The capture had only just been effected; but the cricket, to my surprise, was apparently already dead and must, I suppose, have been killed by a single bite. The mantis held the body of its prey firmly clasped between its fore-legs and proceeded to cut through the neck and decapitate the cricket. This achieved it commenced its meal upon the severed head. It struck me as a feat in itself, the way the jaws combined the two functions of devouring and of retaining the head without ever letting it drop. When the whole of the head had disappeared, the mantis began on the thorax, but had made little progress before my attention was unfortunately diverted. After an interval of between ten and fifteen minutes I came back. The mantis was in the same place, but the whole of the cricket had disappeared, with the exception of the extreme tip of the abdomen with its pair of caudal appendages which projecting from between the jaws of the mantis and was speedily demolished. There were two fragments of legs on the table against the wall below where the mantis was resting, but no sign of any other fragments, so that appearances unquestionably pointed to the mantis having steadily eaten through that cricket from head to tail and disposed of the whole. I much regret having been unable to verify this but have no doubt that it did occur. But the performance seems a remarkable one in view of the comparative bulk of the two insects. The mantis, it is true, was about 3 inches in length, but a slender species, brownish-grey in colour; while the cricket at least ¾ inch long, was more than twice as thick in body. It must be remembered too what a considerable portion of the mantis' 3 inches of lengths is taken up by its long neck. A mantis of the same species which I captured with a view to sending to the Society for identification unfortunately came to grief, but the species is a common one.

It was its stowage capacity, without any obvious tightening of the waist-belt, that especially interested me in this mantis, rather than the size of its prey, for these insects will sometimes successfully attack surprisingly large creatures. Three years ago in the Aden Hinterland I came across a large green mantis on a cornstalk, and securely grasped between its legs a large green grasshopper of locust of about the same size as *Acridium peregrinum*. Here again the mantis had commenced on the head of which it had devoured about one-third, but the unfortunate locust was still alive and capable of some movement—and yet some people say there is no cruelty in nature. In this instance, but for the evidence of my own eyesight, I should certainly have considered the locust too powerful an insect for any mantis to tackle with success.

That the love passages of certain spiders have at times a tragic ending

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for the male is well-known. But has a similar crime ever been recorded of the mantis family? Some years ago in the Empress Gardens at Poona I found a mating pair of a large green species and the female was quietly dining off her lord and master! This may seem incredible, but is nevertheless absolute fact. Could the suffrage have been in question?

A. H. MOSSE, CAPT., I.A.,
Assistant Resident, Okhamandal.

DWARKA, *4th November* 1910.

No. XXXVII.—A NEW INDIAN GRASS-HOPPER INJURIOUS TO AGRICULTURE (*COLEMANIA SPHENARIOIDES*, BOL.).

In October 1909 specimens of a grass-hopper were sent to the Entomological Laboratory in Bangalore from Davanagere in the northern part of Mysore with the statement that they had been noticed for the first time and that they were doing some damage to crops, chiefly to cholam (*Andropogon sorghum*). Later in the same season specimens of the same form were collected at Honnali about 30 miles west of Davanagere where the damage to cholam had in cases been very severe.

This grass-hopper was identified provisionally as a species of Orthacris and specimens of it were sent to Prof. Ignacio Bolivar of Madrid, the leading authority on the sub-family *Pyrgomorphinæ* to which this genus belongs. Professor Bolivar informed me that the grass-hopper was not an Orthacris but belonged to a new genus. In the mean time a note by Mr. Maxwell Lefroy on the same grass-hopper appeared in this Journal, No. 4, Vol. XIX, (1910), page 1007, in which he proposes for it the name "Deccan grass-hopper" on account of its distribution. He also notes its growing importance as a pest and identifies it as an Orthacris, probably a new species.

Prof. Bolivar has now published the descriptions of the new genus and species in the Boletin de la Real Sociedad Española de Historia natural, July 1910 (page 319) under the title "Nuevo Locústido de la India, Perjudicial á la Agricultura (*Colemania sphenarioides*, Bol.)." As it seems probable that this Spanish journal is inaccessible to most of those interested in Entomology in India and as this insect is likely to prove of increasing importance from a practical standpoint, I have thought it advisable, with Prof. Bolivar's permission, to communicate his descriptions to this Journal. I retain the descriptions in their original latin form. As the rest of Prof. Bolivar's paper is written in Spanish and is largely based upon the notes sent by me I have translated those parts of it which are of particular interest.

"*Colemania, gén. nov.*

Corpus elongatum, subcylindricum, in ♂ valde fusiforme, medio fornicatum. Caput conicum. Fastigium elongatum superne carinula media distincta, horizontaliter productum, antice obtuse rotundatum, oculo

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longius. Frons valde reclinata a latere visa subsinuata. Antennæ . . ? basi cylindricæ; costa frontalis tota sulcata, basi tantum compressa denique deplanata parum distincta ante epistomatem obsoleta, carinis lateralibus sinuatis ab antice visis antrorsum parum divergentibus. Genæ linea granulosa parum expressa sed distincta instructæ. Oculi parvi parum longiores quam latiores postice truncati. Ocelli parum distincti, ocello medio inter oculos, ocellis bassalibus ante oculos positis. Pronotum conicum præcipue in ♂, in ♀ fere cyclindricum postice obtusissime sinuatum, sulcis in dorso oblitteratis, tantum sulco typico longe pone medium sito percurrenti; lobis lateralibus elongatis, marginibus integris, margine antico obliquo, inferiore recto, postico subindistincte sinuati, angulo antico obtuso, postico subrecto. Elytra, angustissima, linearia, elongatissima, pronoto longiora. Alæ nullæ.

Prosternum tuberculo acutissimo aciculato instructum, lobi mesosternales elongati, postice truncati ♂ contigui, in ♀ spatio antrorsum ampliato, his angustiore sejuncti, angulo postico rotundato. Foveolæ metasternales in ♂ quam in ♀ magis appropinquatæ. Pedes breves; femora antica in ♂ incrassata; femora postica gracilia area media externa angusta rugulis pinnatis subindistinctis, lobo geniculari angulato producto. Tibiæ posticæ, graciles in tertia parte apicali tantum ampliatæ et superne planatæ intus extusque spina apicali armatæ, extus 9 intus 11 spinosæ. Tarsi postici graciles; articulus primus secundo duplo longiore. Abdomen cyclindricum, apice haud clauatum. Segmentum ultimum dorsale ♂ transversum postice trisinuatum. Lamina supra-anali trigona-elongata cercis longiora, sulcata, acuta, in ♀ subæquilatera. Cerci breves, curvati, apice fere subulati, in ♀ minuti, recti. Lamina subgenitali, compressa, postice compresso carinata. Valvulæ ovipositoris breves sinuatæ."

"*Colemania sphenarioides, sp. nov.*

Straminea vel lutea. Caput pone oculos fascia lata carneo cœrulea vittæ flava ab antennas usque angulum anticum pronoti extensa terminata. Frons carneo cœrulea. Vertex convexus, linea media nigrocœrulea ante oculo latiora, tempora inferne fascia angusta nigrocœrulea. Antennæ articulis primis pallidis articulis sequentibus nigro cœruleis inferne fascia pallida longitudinali ornatis, Pronotum dorso sublævi, medio rufescente, lateribus fascia lutea intus linea nigra apposita; lobis lateralibus callosis punctato impressis, trifasciatis, fascia ab dorsum sita rufa, intermedia nigra, inferiore flava, margine inferiore subsinuato, meso-et metanotum in ♂ valde incrassata dorso lævia, lateribus fasciis protoracicis continuatis, fascia externa impresso punctata. Elytra apicem versus lævissime subampliata apicem segmenti primi abdominis subattingentia, rufescentia venis pallidoribus. Pedes pallidi. Tibiæ posticæ rufescentres, spinis pallidis apice nigro armatæ. Abdomen dorso pallido, lateribus fusco et griseo vittato; segmento primo tympano instructo.

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Long. corp. ♂ 39; fastig. ante oculos, 3; pron. 6, 5; elytr. 8, 5; fem. post., 15 mm.

Long. corp. ♀ 36; fastig. ante oculos, 2, 8; pron. 6; elytr. 6, 5; fem. post. 12 mm.

Loc. Honnalli, 6, 10, 09, L. C. Coleman et K. Kunhi Kannan."

The above description is incomplete as far as the antennæ are concerned as the specimens sent arrived with these organs broken. Prof. Bolivar has therefore added some notes sent by me which were based on the examination of a large number of specimens in the collection here. As the notes he gives are a Spanish translation of my communication to him, I can do no better than give the original English.

"In the antennæ I find the first and second segments pallid with a bluish streak along the outer edge or angle. The rest of the antennæ seems to me to be "nigro-cærulea" with the exception of a pallid streak which extends along the inferior angle of segments 3-8. The antennæ possesses 19 segments and tapers gradually from the third segment to the apex.

I find further that the femora and coxae of the hind legs in good specimens both male and female show a yellow fascia on the external face which is continuous with the lateral yellow fascia of the cheeks and thorax. This fascia narrows to a point towards the apex of the femur; it is, however, indistinct in some of my specimens. I find the hind tibiæ in a few of my specimens reddish throughout their entire length but in the majority of them it is only the apical half that is colored red, the basal half being pallid."

"I append herewith measurements made on 5 females and 5 males :—

Long corporis.	Fastigi ante-oculos.	Pronoti.	Elytrorum.	Fem. post.
	Females.			
1. 39	3	6·8	8	13·8
2. 39·5	2·8	7·5	6·5	14·5
3. 35·0	2·8	6·5	7·0	12·5
4. 36·0	3·0	6·8	7·0	13·2
5. 37·5	3·0	8·0	Broken.	14·0
	Males.			
1. 40·0	3·0	6·2	9·0	14·2
2. 38·0	2·8	5·8	7·8	14·2
3. 33·0	2·6	5·8	5·2	11·8
4. 31·0	2·5	5·0	6·8	Lacking.
5. 33·0	2·8	5·2	7 5	12·8

In connection with the erection of the new genus Prof. Bolivar notes in

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the introductory paragraph of his paper that the new genus belongs to the section Orthacres (*vide* his Pyrgomorphinæ, p. 44, Genera Insectorum 90 me Fascicule) and differs from the genus Orthacris chiefly in that the body has an enlarged or inflated appearance in the thoracic region (meso- and metathorax. In this respect it resembles the genus Sphenarium (*vide* same paper, p. 9) from which, however, it differs in the absence of wings.

The above description should enable any one interested to recognise the grass-hopper. Rearing work on a fairly large scale is being carried out here and extensive observations have been made in the field, so that it is proposed later to publish a fairly exhaustive account of its life-history and habits.

LESLIE C. COLEMAN, M.A., PH.D.,
Mycologist and Entomologist.

BANGALORE, *August* 31*st*, 1910.

No. XXXVIII.—REMARKABLE MIMETIC RESEMBLANCE BETWEEN A CICADID AND AN ARCTIID MOTH.

During a recent visit to the Nilgiris (in April of the present year), I noted a remarkable instance of mimetic resemblance between the Cicada *Gaeana atkinsoni* and an Arctiid moth (*Pangora* sp.).

I must confess to an attitude of scepticism towards a considerable percentage of the supposed cases of mimicry which have been exploited, of late years, in ever-increasing abundance. Many of them have appeared to me to be fanciful, the resemblance requiring an exceptionally vivid imagination for its appreciation, and the imaginary mimics being sometimes dragged together from widely separated habitats. But in the present case, both insects were to be seen on the wing at the same time and in the same place. Mr. H. L. Andrewes, of Barwood Estate (himself an enthusiastic entomologist and careful observer), was with me at the time, and can corroborate my statements. He was, indeed, the first to observe the occurrence and to draw my attention to the extraordinary resemblance between the two insects when on the wing. We were both of us, at first completely deceived, mistaking the flying Cicadas for the brightly coloured moths that we had just captured. It was not merely a general similarity of colouration, but the effect was enhanced by the heavy flight of this Homopteron, so unlike the rapid progression usual to the ordinary Cicadas.

It is not to be expected that a detailed examination of the two insects should show an identical colour pattern; but the general scheme of colouration is close enough to produce an effect of similarity sufficient to deceive the eye when the wings of the insects are in motion.

The moth was either *Pangora erosa*, Walk., or *P. rubelliana*, Swinh., both

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of which species occur in the Nilgiris. The exact determination of the species is unimportant, as they differ only in a slight modification of the paler markings of the forewing, and either would form an equally good model of the *Gaeana*. In the moth, the frontwing is deep brown, crosset by sub-basal and medial irregularly maculate bands of a creamy white tint, and with submarginal spots of the same pale colour. The hindwing is crimson, with a broad, blackish outer border containing some crimson spots near the anal angle. In *Gaeana atkinsoni*, the tegmina are black, with a transverse medial fascia and submarginal spots of a pale ochreous tint: the black ground colour relieved by ochreous venation, so producing a general brownish effect. The hindwings are described by Distant as "bright carmine red, apical and posterior margins and subapical transverse spot black." I think that mental pictures evolved from the descriptions of these two insects would not differ very widely.

The brightly coloured Arctiids are generally believed to exhibit warning colours and to be protected from attack by a distasteful odour or flavour. Little is known as to the immunity or otherwise of the Cicadas. I have, however, observed the capture of *Terpnosia psecas* by an 'Orange Minivet' (*Pericrotus flammeus*). On that occasion the Cicada was evidently uncomfortably strong for its captor. I was attracted to the episode by the scream of the Cicada, which was held by one leg only, and appeared to be flying away with the bird. The minivet could make no headway against the vigorous flight of its captive. The combination looked rather like a badly-balanced aeroplane with an erratic propeller in front.

E. ERNEST GREEN.

PERADENIYA, CEYLON, 20*th August* 1910.

No. XXXIX.—THE OCCURRENCE OF THE GIANT WATER-BUG *BELOSTOMA INDICA* IN THE EASTERN HIMALAYAS.

On the 9th June 1910, I obtained a pregnant specimen of the Giant Water-Bug (*Belostoma indica*), at an altitude of 6,000 feet on the Eastern Himalayas; as I have never seen it at this altitude before, I thought its occurrence here might be worthy of record.

E. A. D'ABREU, F.Z.S.

KURSEONG, DARJEELING DISTRICT,
5*th September* 1910.

No. XL.—A NEW METHOD OF MAKING PERMANENT PREPARATIONS OF MOSQUITOES.

Entomologists and medical men engaged in the study of Malaria frequently have occasion to make collections of mosquitoes. But those who

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have attempted to preserve these insects in the manner usually recommended namely as dry pinned specimens, are often disappointed at the result.

As it is by no means a pleasant thing to have to watch the gradual deterioration of a collection over which much time and trouble has been spent, we are sure that there will be many who will welcome the description of a new and simple method of mounting mosquitoes which provides specimens that are absolutely permanent.

Mosquitoes preserved in the manner described below will be found to show all the points necessary for identification; they can be mounted without great difficulty; can be easily stored and handled, and are ideal for demonstration purposes.

Most people who have worked with mosquitoes have at one time or another attempted to preserve them in balsam. This, of course, is quite hopeless, as directly the balsam touches the specimen, the scales float off, and the specimen is rapidly cleared and becomes almost transparent.

In this new method the specimen is primarily fixed and coated with a thin covering of celloidin, which protects the mosquito from the clearing action of the balsam and prevents the dislodgment of the scales and hairs. The natural appearance of the insect is thus preserved.

METHOD.

The materials required are—

Cover slips—No. 2 Circles.
Hollow ground slides.
Fine forceps.
Mounted needles—two.
Alcoholic solution of celloidin—1 per cent. to 2 per cent.
Emulsion of zinc oxide in Xylol Balsam.

The mosquitoes to be mounted should preferably be bred-out specimens, which have been allowed to harden for some hours before killing.

A live specimen should be transferred to a test-tube or small bottle, and this should be inverted upon a small board upon which a little chloroform has been dropped.

The mosquito should be merely stupefied, and if too much chloroform has not been used, it will frequently fall upon its back with the wings spread out. The absorption of chloroform by the wood will prevent actual wetting of the specimen which would damage the scales.

A drop of the celloidin solution is now placed on a cover slip and the mosquito is picked up with the forceps by one of its legs and dropped back downwards on to the cover slip. If the wings are still closed, they are gently drawn out at right angles to the body, using two needles for this

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purpose and making traction upon both wings at the same time. The legs are now carefully arranged and put down into the celloidin solution on the cover slip, more solution being added if necessary.

If the legs have fallen into the celloidin solution before the wings have been arranged in their proper places, a little careful manipulation with the needles will enable one to pass the wings under the legs or *vice versa* and a few final touches to the antennæ, etc., will bring all the parts into their proper relation.

Another drop of celloidin solution is now put over the specimen, which is then allowed to dry. After about half an hour a further drop of the solution is placed over the thorax, and this again is allowed to become nearly dry.

This specimen is then ready for mounting, either in ordinary balsam, or in the mixture of zinc oxide and balsam, which is less liable to penetrate the celloidin than ordinary balsam, and at the same time shows up the points of the specimen to advantage.

To prepare this zinc balsam, the zinc oxide should be sifted through fine muslin and a sufficient quantity added very gradually to xylol balsam until a thick uniform opaque white mixture has been obtained.

A big drop of this zinc balsam is placed in the hollow of a slide, which is then inverted upon the specimen ready prepared on the cover slip. The hollow of the slide prevents the crushing of the specimen and saves the bulky thorax from damage.

Although an advantage, hollow slides may be dispensed with, if the thorax of the fixed mosquito is carefully snipped off by means of a pair of fine iris scissors.

As zinc balsam takes some time to harden, specimens should be kept face downwards for several days until hardening has taken place.

Precautions.

Strength of celloidin solution to be used.—This will depend largely upon the atmospheric conditions, a weaker solution being necessary when drying is rapid. The point to be aimed at is to obtain a solution which will allow sufficient time for manipulating the specimens with needles, and at the same time will afford an adequate coating.

The tendency at first will be to use too strong a solution of celloidin. Ethereal solution should on no account be used, as the rapid evaporation leads to the formation of air bubbles which ruin the specimen.

Drying of the specimen before mounting.—If the specimen be allowed to dry for too long before the final mounting, the contraction of the celloidin will result in the formation of cracks through which the balsam will subsequently penetrate, or it may be found that separation of the mosquito from the surface of the cover slip is taking place.

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The method described above will be found useful for preserving many other small-bodied flies besides mosquitoes, and will, we think, be welcomed by all those who wish to make collections under tropical conditions.

CHAS. A BENTLEY, M.B., D.P.H.,
J. TAYLOR, CAPT., I.M.S.

BOMBAY BACTERIOLOGICAL LABORATORY, PAREL,
BOMBAY, 11*th August* 1910.

No. XLI.—OBSERVATIONS ON THE SPIDER *GALEODES INDICUS*.

But little is known about the group of arachnids to which the subject of this note belongs. The *Cambridge Natural History* contains but 8 pages on the whole order (*Palpigradi*). A few notes made with a captive female under observation, therefore, may be of interest.

All Indian *Galeodes* are, I believe, nocturnal in habit; although sometimes met with during the day time, it is generally because they have been disturbed out of some dark retreat.

They are very nimble and course rapidly about at night in search of prey, insects of practically all descriptions, and sometimes come within the circle of one's lamp in pursuit.

From an external casual examination, armed as they are with two pairs of formidable toothed mandibles, one would suppose that these creatures tear and bodily devour their prey. This, however, is not the case. The terrifying jaws are but the portals to a narrow beak or tube formed by the fusion of the labium and labrum and capable of admitting fluids alone. The mandibles perform the duties of seizing and crushing the insects fed upon.

If the jaws are separated laterally, the beak can be seen protruding shortly between them.

These powerful mandibles are capable of great lateral and vertical motion so that comparatively large insects can be seized. There is marked muscular development of the basal portion of the mandibles, which, at first sight, seem to form part of the cephalothorax, and they are capable of exerting considerable crushing force. Owing to this large development, when the jaws are working, the whole head seems to take part in the movement.

The possession of poison by members of this family is still in doubt; the work already quoted states:—"Several investigators have allowed themselves to be bitten without any special result" (Vol. IV, p. 424). I regret that I have no very positive fact to give on this subject, but I noted that every insect firmly seized seemed immediately paralysed, and I could never detect the smallest movement of leg or antenna after the first bite.

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The appetite of the *Galeodes* seemed quite insatiable; my specimen was ever eager for a meal. The insects and others consumed consisted of a number of moths, several small beetles, such as are attracted to the lamp in the evenings, two spiders, an Asilid fly, a large locustid at least twice the bulk of its captor, and a blister beetle.

On the hard integument of one of the common light-brown cock-chafer like beetles, she could make no impression, though she attacked it repeatedly with great vigour and wide extended jaws.

Unfortunately, I did not see the locustid actually assailed as the *Galeodes* seemed overawed at first. They were left together one night and only the arachnid and some *debris* were to be seen in the morning.

The blister beetle gave most trouble as might well be expected. It was attacked at once on being inserted in the jar, but the *Galeodes* dropped it at once on the first slight nip. The bite was not driven home and the beetle curled itself up in the posture of object humility they are addicted to on being molested and exceeded a drop of its acrid secretion. *Galeodes* had evidently received a taste of it and found it unsavoury, for she backed away and seemed to be scraping her cheliceræ on the floor of the jar, gaping the two pairs wide apart, for all the world as if she were about to vomit up the nauseous draught. This manœuvre was reiterated several times, but evidently the jaws never really closed, for the beetle seemed little the worse.

At last the aggressor seemed to have come to the sour-grapes frame of mind and desisted from further attempts. However, I left the uncongenial morsel with her for the night and lo! the morning revealed that the pangs of hunger had overcome the hatefulness of the fare, for all that was left of the beetle were scarcely recognisable mangled fragments.

As before stated *Galeodes* do not eat their victims bodily, but suck out their juices. The carcase of the prey is crushed and deftly manipulated round and round by the mandibles going over each section again and again till all the sap is expressed. The suctorial beak lies handy for being applied to the battered framework the while. Within the beak there is a muscular sucking chamber which draws in the fluids.

C. E. C. FISCHER.

COIMBATORE, 3*rd October* 1910.

No. XLII.—FURTHER NOTE ON THE SPIDER *NEPHILA MACULATA*, FABR.

Two notes on the above-named spider were printed on pages 526-528 of No. 2, Volume XX of the *Journal*. In the first I noted that the female was in no way aggressive during pairing. I have recently observed another incident where the female was not so complacent.

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In this case there were five males in the web. Just after I caught sight of the structure with its occupants in an open grass area, depending from a tall grass stem and a bush, one of the males was seen to descend rather deliberately towards the female, the latter resting head down in the centre of the snare. On reaching the extremity of one extended hind leg of the female, he paused and then advanced again very slowly till he reached the posterior end of her abdomen. After another short pause, he crept very cautiously on to and along it towards the vulva. While so doing one of his legs brushed along the female's side and she pushed it away with the short 3rd leg of that side. This again caused a pause and progress was resumed once more with redoubled caution, but again a leg passed over the side and was again brushed away, but this time there were further quick movements of the other legs of the female. Instantly the male flung himself to the bottom of the web, out of reach of his spouse. The incident passed so extremely rapidly, that I was unable to follow the exact movements, but had no doubt that an attack had been contemplated, and it was obvious the little male was of the same mind, or, at least, was taking no chances. There was no attempt at pursuit.

No further developments taking place for some considerable time I left the spot.

At this late date (19th October), it is probable that the female had already paired, which might account for the repulse of unwelcome attentions.

This occurrence took place at about 30 miles from the location of the other two reported and at an elevation of about 1,800 feet on the banks of the Bhavani river.

C. E. C. FISCHER.

ATTAPADI VALLEY, SOUTH MALABAR, 24*th October* 1910.

No. XLIII.—THE COURTSHIP OF WHIP-SCORPIONS.

Some years ago, when in Ganjam, I witnessed the antics of two whip-scorpions (*Thelyphonus sepiaris*, Butler), which I quite failed to interpret, but which, since reading Fabre's observations on scorpions, I unhesitatingly ascribe to amorous dalliance.

Fabre describes what he terms the *promenade a' deux*, in which the male scorpion seizes the chelæ of the female in his own and walks backwards, the female following usually without reluctance.

In the case of *Thelyphonus*, I noticed that one of the pair seized the antenniform first pair of legs with its chelæ inserted and held their tips between its mandibles. The pair then moved, more or less, as described by Fabre in the case of scorpions. The captive seemed, however, somewhat reluctant to follow, but still made no effort to escape when released;

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I should describe the altitude as tolerant. This latter was evidently the female.

When I separated the couple, the male, the aggressor as I thought at the time, seemed much distressed and dashed about in search of the other, without concern or fear of the compulsive interfering agency, and as soon as he found her again, repeated his previous actions. The female made no real attempt to evade the other or prevent her legs being pinioned. So far as I saw the caudal flagellum of either never came into play.

Not knowing what was afoot, I did not wait for final developments, but after watching the couple for a short time, and what I took for an engagement being apparently somewhat in the nature of a "Tweedledum" combat, I stopped further display in good spirits.

C. E. C. FISCHER.

COIMBATORE, *3rd October* 1910.

No. XLIV.—CURIOUS GROWTH OF THE PALMYRA PALM *BORASSUS FLABELLIFER*, LINN.

Mr. Douglas in his interesting book about "*Bombay and Western India*" in alluding to a visit he once paid to the Tansa Valley in the Thana District, writes as follows, regarding the numerous Palmyra Palm trees (*Borassus flabellifer*, Linn.) which he noticed on the way (pages 293-294 Volume II) :—

"The only noteworthy objects are hybrid trees, which are remarkable enough even in India. Grafting, as a rule, applies to trees of the same order, but this is not without exception. But what do our readers think of a *ficus* with a palm which, as a friend observes, must be the centaur of the vegetable world ?

"The first specimen met with I set down as a *lusus naturæ*, but further on they became as thick as blackberries.

"Take one of the pollard willows of Oxfordshire, or a tufted elm from Richmond Hill, lop its head off 20 feet from the ground and *join on* the upmost 40 feet of a palmyra palm, and you have our friend of the Tansa Valley. Not weakly either, but strong and vigorous specimens of the palm tree flourishing. We were told that these are not cultivated, and the line of contact is not visible to the naked eye. We throw out this nut to crack by some of our Bombay botanists or others interested in Indian arboriculture."

The phenomenon which Mr. Douglas observed is probably one which could be explained by most District Officers interested in the study of the Natural History of Plants. The so-called hybrid trees, mentioned by him, are very common in the Western parts of the Thana District, in the

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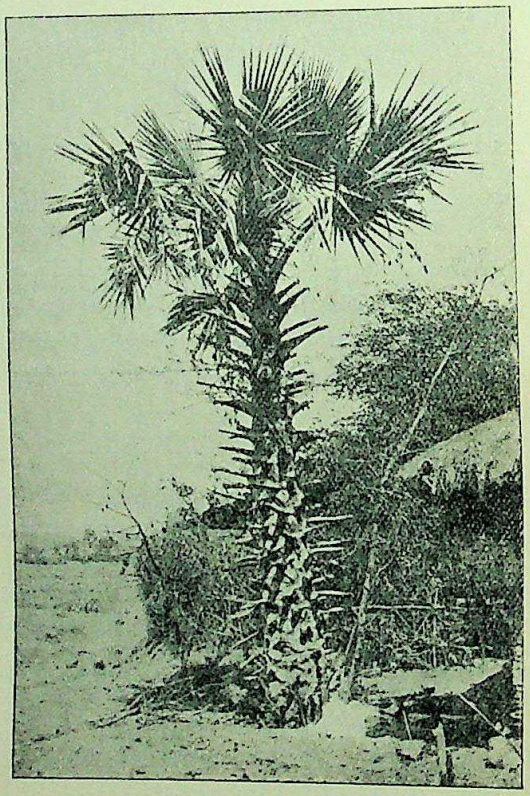
Salsette snd Bassein Talukas especially, and they may be seen also in the Kalol Taluka of the Panch Mahals, Gujarat. In Bassein in the neighbourhood of the villages of Shirgaon and Kaman and Paye, almost every other tree is a so-called hybrid. The curiosity of growth occurs by the seeds of the various kinds of *Ficus* being deposited in the axils of the foot stalks of the leaves of a young Palmyra Palm by Crows and Mynas (*Achridotheres ginginianus*) chiefly and by the *Dicaeum erithrorhynchus* (Tickell's Flowerpecker), who feed on the fruits of the latter. The birds after plucking the fruits of the *Ficus* fly away and alight on the summit of the Palmyra, where they indulge in their meal without fear of molestation. After eating the fruit, the seeds are voided undigested in a very short space of time (in some instance 7 minutes from the time of eating *), and they fall on the ground, perhaps at the base of the tree or in the axils or petioles of the old leaves, which may commonly be observed surrounding the trunk in a decayed state muffling the stem as it were (Photograph No. 1). It is



No. I.

* *N.B.*—I had the birds under observation in captivity.

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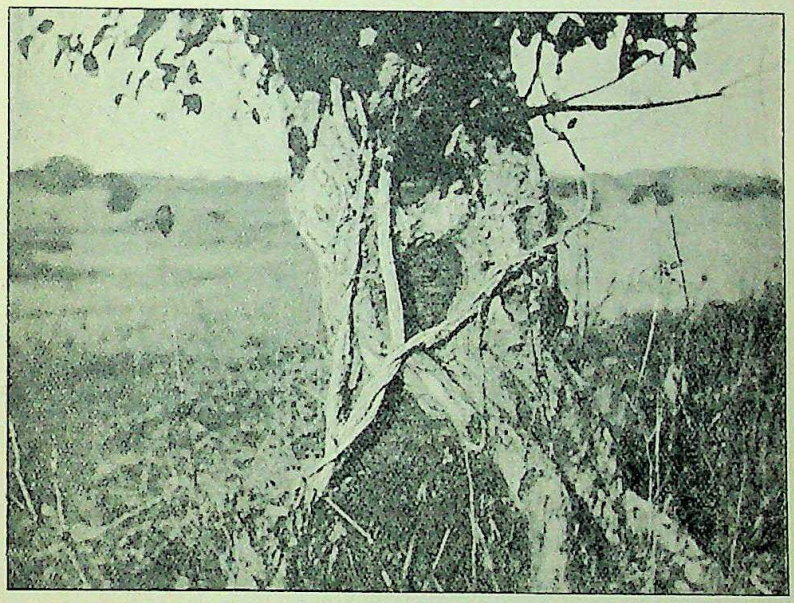
only stems of 15 to 25 years old that are seen in this state ; for after this, most trees become fertile and are tapped either for toddy or exploited for fruit. To facilitate climbing up the bole therefore the sheaths are usually at this period removed, if the tree be a female and good fruit bearer, or a male and good toddy producer. The seeds once so deposited in the axils of the foot stalks germinate, and the *Ficus*, whose roots are epiphytic in habit, proceeds to extend the latter in Octopus like fashion downwards in all directions until the thin strands encircling the base form such a close network that they cohere, forming a thin plaster as it were, almost entirely concealing the black cylindrical trunk of the Palmyra. An illustration of such a case will be seen in Photograph II.



No. II.

Here, as will be observed, the roots of the *Ficus* (in this case the tree is the common Banyan (*Ficus bengalensis*, Linn.) have not completely concealed the Palmyra trunk. Until such roots reach the ground, very little, if any, vegetative activity of the plant is maintained upwards, *i.e.*, few, if any, leaves are borne on the stem. All, or mostly all, the vegetative activity and energy are displayed in a downward direction to reach the moist earth ; and when the latter has been attained, the Ficus begins to grow with increased vigour upwards and downwards and to completely embrace the stem. In a few years, under such circumstances, the sight presents itself of the Palmyra trunk being completely concealed and the Palmyra tree ultimately appears to be growing out of the centre of a Banyan (as in

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Photograph III). The ordinary traveller passing hurriedly along as

No. III.

Mr. Douglas did, might well be excused for being deceived by this phenomenon under the circumstances.

It may be interesting to mention that at the northern extremity of the Vehar Lake, I came across a young Palmyra, whose bole was in the process of being embraced by four different Figs, such as *Ficus bengalensis*, *Ficus Tsiela*, *Ficus religiosa* and *Ficus glomerata*. Tickell's Flower-pecker, I magine, is mainly responsible for this phenomenon, as this pretty little bird is very common round the Vehar Lake catchment area forest.

KARACHI, 29th *September* 1910. G. M. RYAN, F.Z.S.

No. XLV.—THE VARIETIES OF HIBISCUS CULTIVATED IN GARDENS.

Mr. O. V. Bosanquet, I.C.S., the Resident of Baroda, in a letter recently asked for information in regard to the different varieties of Hibiscus in cultivation in gardens on this side of India, and this inquiry induced me to try and ascertain how many could be found. No one appears to have

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a collection at the present time, although, I learn, that Mr. Krumbiegel, the Superintendent of the Lal Bagh Gardens, Bangalore, is starting one. Many years ago, Mr. Robert Campbell had a considerable number of varieties at his garden on Malabar Hill, Bombay, and a Parsee gentleman, the late Mr. Framji Nanabhoy Davar, also possessed some 25 different varieties at his garden at Tardeo, Bombay.

The difficulty of distinguishing clearly between varieties has been somewhat increased by the hybridisation of some, so that I can only describe the colours of the flowers and cannot give names, except in a very few instances. The following varieties were shown at our meeting on the 29th September 1910, and it may be of interest to put them on record.

Double Varieties.

1. Double white changing to red (*Hibiscus mutabilis*).
2. Salmon with dark crimson eye.
3. Scarlet with dark crimson eye.
4. Scarlet with no eye.
5. Scarlet and white, mixed stripes.
6. Dark maroon (the flower of this variety frequently does not open properly).
7. Double white (*H. syriacus*).

Single Varieties.

1. Pale biscuit with white eye.
2. „ „ with crimson eye.
3. Salmon with crimson eye.
4. „ „ (semi-double).
5. Deep salmon or apricot, with crimson eye.
6. Pink with white stripe on inside of petal, crimson and white striped eye.
7. Pale pink with crimson eye.
8. Pale pink with no eye.
9. Pink with red eye.
10. Pink (*Hibiscus mutabilis*).
11. Rose pink with cerise eye.
12. Rose pink with no eye.
13. Light crimson with small dark eye.
14. Light crimson with large dark eye.
15. Scarlet with crimson eye.
16. Crimson (*H. rosa sinensis*) normal.
17. „ „ „ with recurved petals and darker eye.
18. Cut-petalled (*H. schizopetalus*). There appear to be 2 varieties of this.
19. Mauve lilac with red eye (*H. syriacus*).
20. Yellow, small flower.

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21. Reddish orange, small flower.
22. Tree variety: white or flesh-coloured small open flowers with dark reddish eye (*H. collinus*).
23. Tree variety: large yellow flowers with maroon eye, flowers turning red when old. Leaves three lobed (*H. tricuspis*).
24. Tree variety: large tawny red flowers with dark crimson eye, thick fleshy leaves, cordate to almost circular (*H. tortuosus*).

H. rosa sinensis cooperi with variegated leaves and *H. tiliaceus*, a tree with yellowish flowers, although not amongst the specimens exhibited, are also to be found in our Bombay gardens.

If any members have specimens of any other varieties, I shall be glad if they will communicate with me.

BOMBAY, *October* 1910. W. S. MILLARD.

No. XLVI.—NOTE ON SUBMERGED TREE STUMPS DISCOVERED IN BOMBAY HARBOUR.

(*With an illustration.*)

In a paper published in our Journal, Vol. V, No. 2, 1890, entitled "Prehistoric Bombay" by W. E. Hart, an account is given of the various evolutions of nature that took place before our present Bombay as a single Island, to quote Mr. Hart's words, "rose, as did of old, the Goddess of Beauty from the sea."

To shortly summarise Mr. Hart's paper, he deduces from the evidences of marine and land fossils in the deposits on the flats and at Byculla and the discovery of a submerged forest in the excavation of Prince's Dock, that after the various flows of the trap had completed the general formation of this portion of Western India, an area of some 1,000 square miles, including what is now Bombay, broke off from the Coast and was submerged in the sea; and that subsequently in the area that includes Bombay there were at least 2 upheavals and the subsequent subsidences, the last of which left Bombay as a succession of Islands which were eventually joined together by the silting up of the deposits brought down by the neighbouring creeks.

The purpose of the present note is to place on record the finding of some additional trees in somewhat similar circumstances to those mentioned in Mr. Hart's paper, as having been found by Mr. George Ormiston in the excavation for the Prince's Dock. Mr. Ormiston states that he discovered some 400 trees, 223 of which were still standing at a depth of about 32 feet below high water. Of those fallen several showed signs of having been burnt, from which he deduces the presence of man.

The trees or rather tree stumps discovered during the excavation for the New Docks were only 4 in number, 3 of which were standing. Their position is nearly half a mile from what was a few years ago the foreshore

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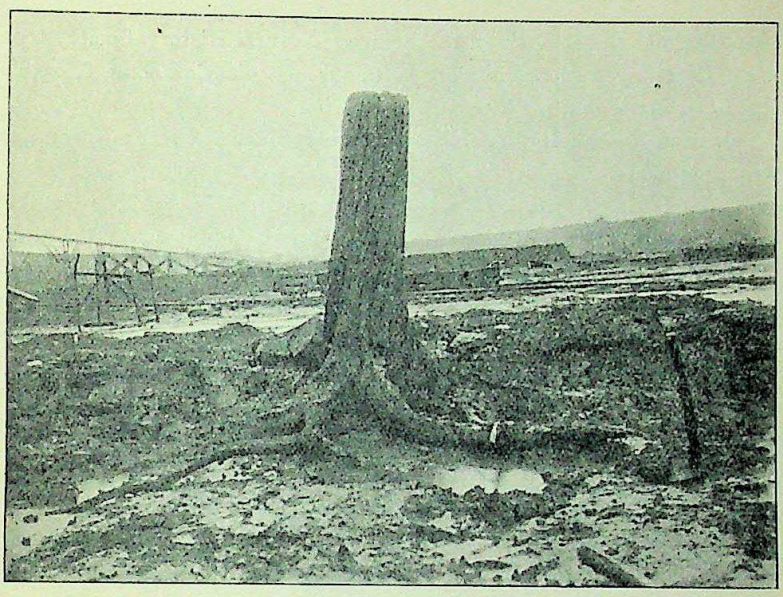
and 40 feet below high water O.S.T. The largest of the stumps is 6·3 in height and 5 feet diameter.



These trees appear to have been growing on the side of a creek which is filled with a light blue clay. In this blue clay, a lot of drift wood, containing fossils of the *Toredo navalis* was found. The illustration is of one of the largest of the stumps found standing, the roots of which are seen spreading out over the rocky moorum. This tree was embedded in the blue clay with a very thin layer of moorum between the clay and the rock. Specimens of two of the three stumps were exhibited at our meeting in the hope that some of the botanical members present might be able to identify them. The trees found in the Prince's Dock were stated to have been a specimen of Acacia (*Acacia catechu*). I have compared this timber with some of that taken from the Prince's Dock, and as far as I can tell it is the same. Some of the drift wood which, it will be noticed, has quite perished, although the toredo and portion of the wood has been fossilised, was also exhibited. Two of the tree stumps are still standing, and I should be glad to show them to any members who are interested in the subject. The finding of these trees does not throw any new light on the conclusion arrived at by Mr. Hart, but simply shows that the last subsidence was one of over 40 feet and that there was dry land at least ½ mile from the foreshore opposite St. George's Hospital; also that in these ancient times our present fine harbour was one of a very much reduced size, if it existed at all.

BOMBAY, 29*th September* 1910. L. H. SAVILE.

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PROCEEDINGS

OF THE MEETING HELD ON 29TH SEPTEMBER 1910.

A Meeting of the Members of the Bombay Natural History Society took place on Thursday, 29th September 1910, at the Society's Rooms, 6, Apollo Street, Fort, Mr. John Wallace, C.E., presiding.

The election of the following 11 new members since the last meeting was duly announced :—

Mr. C. H. Hearsey, S.F.S. (Kaubalu, Burma) ; Hon'ble Surgeon-General H. W. Stevenson, I.M.S. (Poona) ; Mr. A. S. Campbell (Jalgaon) ; Mr. C. E. Pargeter (Balaghat, C.P.) ; Mr. H. S. G. Vidal (Bombay) ; Major A. S. Teed (Multan) ; Mr. P. M. D. Sanderson (Bombay) ; Major J. Frizelle (Multan) ; Mr. C. E. Fendall (Seraham, P.O., Bussahir State, Simla District) ; Mr. G. E. C. Wakefield (Hyderabad, Deccan) ; and Mr. B. H. Backhouse (Itarsi, C.P.)

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following contributions to the Museum since the last meeting :—

Contribution.	Locality.	Donor.
1 Flying Fox (*Pteropus medius*) ..	Nasik ..	L. H. Savile.
2 Red-breasted Paroquets (*Palæornis fasciatus*).	Assam ..	E. O. Shebbere.
4 Eggs of Pheasant-tailed Jacana (*Hydrophasianus chirurqus*).	Kashmir ..	Major J. W. L. Elgee.
13 Houbaras, (*Houbara macqueeni*), 3 Black Partridge (*Francolinus vulgaris*) 9 Rain (*Cortunix coromandelisa*) and Grey Quail (*Cortunix communis*), 4 Squirrels (*Funambulus sp.*)	Mirpurkhas ..	E. Priestley.
1 Snake (*Simotes juglandifer*) ..	Ootacamund ..	H. C. Jeddere-Fisher.
Dark-coloured Dhaman (*Zamenis mucosus*).	Bombay ..	E. R. H. Jackson.
11 Snakes	Kognole, Belgaum.	Vasuvada.
Chameleon (*Chamæleon calcaratus*) (alive).	Dharwar ..	T. H. Abraham.

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Contribution.	Locality.	Donor.
1 Young Saw-fish	Bombay ..	Capt. Hussells Yates.
20 Beetles and a few Hymenoptera.	Darjeeling ..	S. G. Wood.
39 Beetles	Kurseong ..	E. A. D'Abreu.
18 Land crabs of 9 species ..	Various ..	In exchange with Indian Museum.
Series of shells showing development of the Pearl Oyster, (*Marginefera* sp.)	Jamnagar ..	J. Wilson Pace.

Minor contributions from Colonel Penton, R.A.M.C., Captain Lawson, Mrs. Monteath, Messrs. E. R. Jardine, H. S. Wise, F. C. Purkis, S. G. Wood, C. E. Dunford, W. S. Millard, S. D. Smith, S. H. Prater, P. Gerhardt, L. H. Savile and B. D. Richards.

SMALL GAME SHOOTING SEASON, 1910-11.

The Honorary Secretary mentioned that it was intended to again issue in the next number of the Journal a "Small Game Shooting Return," and he appealed to all members to either fill in the schedule themselves or get their friends to do so.

In the number of the Journal about to be issued (No. 2, Vol. XX), there was a short report on the shooting season of 1908-09, which was based on only 28 returns, and was therefore very incomplete. From various causes, this report had been delayed, but it is hoped, in future, to issue it in the first number of the Journal which comes out after the shooting season. The schedule had been enlarged to enable fuller information to be given, which would add to the interest of the report. The Honorary Secretary drew the attention of those present to the fact that not a single return had been made by a Bombay member for the season 1908-09; and, therefore, he regretted to say the Bombay district was not mentioned in the Report.

He added that, considering there must be at least 500 members of the Society who shoot regularly, more schedules should be returned, and he hoped that there would be a much larger number sent in at the end of the coming season.

Actual dates are required particularly for Snipe, Duck and Grey Quail, arrivals and departures; and members are specially requested to note whether the Snipes are "Fantail" or "Pintail."

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LIBRARY.

The Honorary Librarian, Mr. B. D. Richards, acknowledged amongst recent additions to the Library :—

The "Ibis" 1890—1902 presented by Mr. E. Comber.

Catalogue of Birds' Eggs—4 Volumes presented by Trustees of British Museum.

"Rhopalocera Malayana," by W. L. Distant, purchased,

and certain back parts of the "Avicultural Magazine," presented by Major Rodon.

EXHIBITS.

Mr. L. H. Savile exhibited specimens of a tree stump from the Bombay Harbour and enlarged photographs of the trees *in situ*.

Mr. W. S. Millard exhibited a few new plants introduced into Bombay, namely, *Gloriosa rothschildiana*, *Odontodenia harrisii*, *Clerodendron urticaefolia*, *Tecoma smithi* and *Musa coccinea*, all in flower; and the foliage plants *Dieffenbachia majesticus* and *splendens*, *Tococa latifolia*, *Nepenthes mastersiana*, *Phœnix rœbelini*, *Dracaena sanderiana* and *broomfieldi*, *Musa vittata*, *Cissus causterlii*, *Heliconia Edwardus Rex*, and young specimens of the handsome flowering tree *Gliricidia maculata* and the candle-tree *Parmentiera cereifera*, the last two having been raised from seeds received from Peradeniya.

PAPERS READ.

Note on Prehistoric Tree-stumps discovered in Bombay Harbour.

Mr. L. H. Savile said:—The note on prehistoric tree stumps discovered in the Bombay Harbour records the finding of 4 trees of a species of Acacia, embedded in the blue clay which overlies the rock moorum at a depth of 40 feet below the level of high water spring tides. The position of these trees, which was shown on a plan, is nearly half a mile from what a few years ago was the foreshore opposite St. George's Hospital.

Reference was made to a paper by W. E. Hart on "Prehistoric Bombay," which mentions the finding of similar trees in the excavation from Prince's Dock, and the present discovery goes to confirm the conclusion arrived at by Mr. Hart that our present Bombay has experienced at least two upheavals and subsequent subsidences before as a single Island—

"She rose, as did of old, the Goddess of Beauty from the sea!"

Note on the varieties of Hibiscus cultivated in Gardens.

Mr. W. S. Millard said he need hardly apologise for introducing an Horticultural subject, as it was impossible to separate Horticulture from Botany or from Agriculture. It was recognized almost everywhere now that these sister subjects must advance hand-in-hand, and it was only on

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this side of India that the branch of Horticulture had been so woefully neglected, although in Agriculture we had the reputation of being in advance of the rest of India. Mr. Millard said he had frequently been beseeched to start a Horticultural Society for Bombay, but he could not see how any material advantage was to be gained by such a Society without a Horticultural garden in which experiments could be carried on. Once possessing such a garden, he believed that the large amount of interest, which was taken by residents of Bombay, would ensure a flourishing Horticultural Society.

He said from information he obtained, he believed that various persons had from time to time made collections of the different varieties of Hibiscus. Mr. Robert Campbell, many years ago, had a good collection at Malabar Hill, and he remembered hearing of a Parsee gentleman living, he thought, at Tardeo, who possessed some 25 different varieties; some of these varieties seemed to have disappeared, and as the European's residence in India could never be more than a temporary one, it was greatly to be desired that Native enthusiasts in horticulture should try and establish collections of these and other flowers (which might almost be called indigenous now to India) and thus guarantee continuity.

Mr. Millard said that his attention had been drawn to this subject by Mr. O. V. Bosanquet, I.C.S., of Baroda, who was trying to start a collection there. He then referred to different varieties, of which 24 single and 7 double were shown.

The following gentlemen were thanked for sending specimens :—

Mr. C. M. Cursetjee, Dr. R. F. Seervai, the Superintendent, Victoria Gardens, Mr. W. P. Pechey (Byculla Club), Col. K. R. Kirtikar, I.M.S. (Retd.), Lt.-Col. J. G. Hojel, I.M.S., Capt. Haymes (R. A.) and Mr. John T. Fry.

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THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.

PART IV.

(*With Plate IV*)

(*Continued from page* 602 *of this Volume.*)

Family—CHARADRIIDÆ.

Genus—GALLINAGO.

GALLINAGO GALLINULA.

The Jack Snipe.

Scolopax gallinula.—Linn., Syst. Nat., i, p. 244 (1766); Seebohm, Charadriidæ, p. 480.

Gallinago gallinula.—Blyth, Cat. p. 272; Jerdon, B. of I., iii., p. 676; Hume, Str. Feath., i, p. 235; Adam, *ibid*, p. 395; Butler, *ibid*, iv, p. 15; Fairbank, *ibid*, p. 263; *id.*, *ibid*, v, p. 410; Hume & Dav., *ibid*, vi, p. 459; Dav. and Wendon, *ibid*, vii, p. 88; Ball, *ibid*, p. 228; Cripps, *ibid*, p. 302; Hume, *ibid*, p. 484; *id*, Cat. No. 872; Scully, Str. Feath., viii, p. 356; Legge, B. of Ceylon, p. 828; Hume and Marsh., Game B., iii., p. 373; Vidal, Str. Feath., ix, p. 89; Butler, *ibid*, p. 428; Reid, *ibid*, x, p. 69; Eden, *ibid*,

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p. 165; Davidson, *ibid*, p. 320; Davison, *ibid*, p. 314; Taylor, *ibid*, p. 465; Oates, B. of B., ii, p. 384; Barnes, B. Bom., p. 346; Hume, Str. Feath., xi, p. 321; W. Gaye, Journal, B.N.H.S., vi, p. 418; Stuart Baker, *ibid*, xii, p. 501; A. L. Butler, *ibid*, xiii, p. 149; Inglis, *ibid*, xiv, p. 771; Marshall, *ibid*, xv, p. 354; Wall, *ibid*, p. 72; Macdonald, *ibid*, xvii, p. 500; Dresser, Pal. Birds, ii, p. 763; Blanford, F. of B. I., iv, p. 292; Bahr, *Ibis*, 1907, p. 29; Dresser, "Eggs of Eur. Birds," p. 690; Finn. Ind. Waders, p. 150; Bahr, Proceedings Z. S., June 1907, p. 28.

Limnocryptes gallinula.—Sharpe, Cat. B. M., xxiv, p. 665; *id.*, Hand List, i, p. 166; Oates, Game Birds, ii, p. 131; *id.*, Cat. Eggs, B. M., ii, p. 66.

Vernacular Names.—*Chota Chaha* (Hin.); *Chota Bharca* (Nepal); *Olan* (Tamil); *Tibad*, *Pan Kawa* (Mahrati); *Daodidap Gajiba* (Cachari).

Description.—*Adult male*.—Crown to nape velvety black, stippled with rufous, a very broad supercilium pale buff; sides of the head dull white marked with rufous brown, two broad brown streaks running from the bill, the upper through the eye, the lower under the ear-coverts. Hindneck rufous stippled with white and dark brown; back, scapulars and rump black, glossed with purple and green varying in different lights, the outer webs of the scapulars buff, forming two bands and the inner more or less barred with rufous; upper tail coverts and tail dark brown with rufescent buff borders. Lesser and median wing-coverts deep brown or black, with very pale buff or white bars, greater coverts dark brown tipped white, wing quills dark brown, the first primary pale on the base of the outer web and the secondaries tipped with white. Chin white, neck, breast and flanks mixed white, brown and rufous, the brown predominating; abdomen and lower breast white, undertail coverts with dark shaft streaks. Underwing coverts white barred with brown on the edge of the wing; axillaries white, sometimes slightly barred with brown but generally pure white.

Adult Female.—Similar to the male.

Winter Plumage.—"Scarcely to be distinguished from the

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summer plumage, except by the greater amount of blackish mottling on the hinder neck and the generally more rufescent colour. The pale bands on the back are lighter" (*sic* brighter ?) "but soon fade with exposure, and wear the paler tints of the spring and summer dress." (Sharpe).

There appears to be no difference in size between the sexes or in the colouration of the soft parts. Hume thus writes of this little snipe :—"I cannot discover any constant or average difference in the sizes of the two sexes; they vary a great deal according to age, but equally large and small birds of both sexes appear to occur. The following is a resumé of my measurements":—

"Length 7·75 to 9·0; expanse 13·25 to 14·80; wing 4·1 to 4·67; tail from vent 1·87 to 2·5; tarsus ·89 to ·95; bill from gape 1·5 to 1·7; at front 1·57 to 1·74; weight 1·53 to 2·48 oz."

"The legs and feet are pale greenish, at times with a bluish or greyish shade, generally more or less olive or yellowish; the claws blackish brown; the irides deep brown; the bill is blackish brown at tip, and darkish brown on nares and along the commissure; the rest paler, sometimes a pale grey brown, sometimes with a fleshy tinge, and sometimes with a dull bluish or slaty tinge, especially towards the base of the lower mandible. Butler calls the colour of the feet "pale olive green."

Distribution.—The latest synopsis of the distribution of the Jack Snipe is that given by Oates in the Second Volume of his Game Birds. He writes :—"The Jack Snipe is found over the whole peninsula of India from the Himalayas to the extreme South and also in Ceylon. It has not yet been obtained in the Andamans and Nicobars and probably does not occur in these islands. To the East it ranges from Assam down to Pegu and to the latitudes of Moulmein, but I cannot discover that it has ever been shot in the Shan States."

"This Snipe, in summer, is found in Northern Europe and Asia up to, and within, the Arctic Circle from the Atlantic to the Pacific Oceans. In winter it migrates to the British Isles, Central and Southern Europe, Northern Africa, Palestine, Persia, India, Burma and China."

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To this we must now add a few other places. Osmaston records it as having been shot by Capt. Turner in 1896 at Port Blair in the Andamans. I have received specimens from the Shan States, and others again from the Federated Malay States. Specimens have also been received by the British Museum from Taiwan (Formosa), Yokohama and Hakodadi.

As Hume says, its distribution in the non-breeding season is very perplexing and the thirty years which have passed since he wrote this have added very little to our knowledge as to its Winter haunts. It breeds, as has already been said, practically right across Northern Asia and Europe but whilst in Winter it is recorded as comparatively common all through Northern Africa and through Asia as far East as Bengal, eastward of this it becomes rare in Burmah and almost unknown in China. It may be that its alleged extreme rarity in China is partly due to the fact that sportsmen are not scattered throughout its whole length and breadth as they are in India and so we have not the same number of sporting records. This is not, however, a satisfactory explanation as there are several European settlements, all with their quota of sportsmen and field naturalists who would almost certainly have come across and shot Jack Snipe had they been there to shoot. Again paucity of sportsmen and naturalists is no reason for the few records of Jack Snipe obtained from Burmah and there can be no doubt that East of the Bay of Bengal the Jack Snipe at once becomes very much more uncommon than it is to the immediate West of it. The only record I can find which shews this bird to be anything but rare East of Bengal is made by Oates in his "Game Birds," p. 479, where he remarks :—"In Upper Burmah where the Jack is fairly common, six may occasionally be bagged in one day. Hume suggested that all our birds were possibly Western migrants, but as he himself added, this is hardly possible as the birds arrive in Eastern India earlier than they do in the West. It seems probable, therefore, that the migration of the Jack Snipe when leaving their breeding haunts is Western and South-Western and on the return journey Eastern and North-Eastern We have already shewn that the trend of migration of

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the Pintail Snipe on its southern migration and on entering its winter resorts is decidedly Western and it would appear that the Jack in Asia carries this Western trend to an extreme.

Within Indian limits the distribution of the Jack Snipe is very irregular and they are not nearly as common as either the Pintail or Fantail though on rare occasions they may be come across in considerable numbers. It is to be found more or less all over the Indian continent at different times during the cold season, but there are few places in which one can rely on obtaining more than an odd bird or two with any certainty.

Tickell says "on one or two occasions, in very jungly places of bog and rank weeds interspersed among rice cultivation, I have found the "Jacks" almost monopolizing the ground, to the exclusion of the Common Snipe, but this is very rare; I think I have met with more to the Southward, on the borders of Orissa, than in any part of Central India, on either side of the Ganges. In the Calcutta markets, where the Common Snipe is to be seen in heaps, dead and alive, the Jacks are seldom to be met with. They seem to me to take to the more retired parts of the country such as Singh Boom, where, especially in the *ghat purrum* (beyond the Ghats) the rice cultivation struggles for mastery with the swampy jungle."

In regard to this note Hume remarks: "He is quite wrong, however, about the Calcutta market, to which thousands are yearly brought."

It is, however, very doubtful whether Tickell was really wrong in his estimate, as Finn says, when discussing this same point, there is no doubt that the numbers do fluctuate considerably year by year, but he watched the Calcutta markets very carefully for nine years and in the year 1882, 83 and 84 I did the same and never did either of us see the Jack Snipe exposed for sale in any quantities. Certainly in no year did the Jack Snipe number on an average one in a hundred of the various snipe thus exposed.

No very careful record was kept in Hume's day as to the comparative number of the various species obtained and all estimates made were very rough and in many cases possibly not quite

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reliable. Fortunately we are now in a position to give actual figures showing the proportion of Jack Snipe to other Snipe shot in many parts of India, sufficient to allow us to give a very close general estimate of their numbers as compared with the Fantail and Pintail.

The most carefully compiled table I have received up to the present is one sent me by Mr. R. F. Stoney of the P. W. D. who has been good enough to let me have a complete account showing the snipe shot by him during the last ten years, 1901-2 to 1910, in the districts of Chingleput, Nellore, Madura, Bezwada, Villapuram, Ellore and Tanjore. From this most interesting table we find that out of 7,131 snipe shot only 60 were Jack and that these were distributed fairly equally throughout the various districts of the Province. Shooting in Cannanore Major Wall, I.M.S., was even less fortunate in coming across this little snipe, for, out of 427, snipe shot, he records that there was only one Jack (B. N. H. S., xv., p. 722).

Again Mr. H. Sauders, sending me notes on the comparative numbers of the different species of snipe shot by him, says that he got no Jack in Ceylon and that in Bangalore out of 274½ couple of snipe only four couple were Jack, but that shooting round about Lucknow Jack Snipe actually numbered no less than 40½ couple in a total bag of 74½ couple of snipe. It seems, therefore, that although Tickell records them as being more plentiful in Orissa than elsewhere, the same does not obtain further South.

From the Deccan also we have regular statistics compiled by Mr. W. Gaye and given in this Journal, (Vol. vi, p. 418) for the years 1888-90. There the total number of Snipe bagged is given as 621 of which only 28 were Jack.

In Bengal in 1883-84 I kept an account of 2,000 snipe shot and amongst these there were no more than 19 Jack of which 8 were bagged in one day. In Behar, Inglis and others report them as "rather scarce" and "rare."

In Upper Burmah, as we have seen, Oates reports them as comparatively common but Mr. K. C. Macdonald in writing on the birds of Myingyan records that Mr. Prideaux shot only three birds

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during the season 1898-99 and that he himself only shot one Jack out of 461 Snipe shot by him in 1899-1900.

In Cachar and Sylhet, as elsewhere, the numbers varied considerably in different seasons. One year Capt. (now Col.) Melville and myself shot 94 couple of Snipe in three days in a bheel near the station of Silchar and got 15 couple of Jack amongst them and that season we must have shot forty couple of Jack at least. One day I got 8 to my own gun. Most years however saw only ten to a dozen killed during the whole cold season and some times the number fell to two or three.

In the Brahmapootra Valley I found them very rare and I do not remember even seeing more than a couple in one day.

The above statistics suffice to show, I think, that the Jack Snipe when compared with the Pintail and Fantail in India is a very much less common bird, though in particularly attractive spots it may occasionally be met with in some numbers. It is also possibly more common West and North of Allahabad than it is to the South and East and gets rare again in the further North and North-West, but our records from the extreme North-West are very meagre.

As to the time of arrival of the Jack Snipe in India and the average date of its departure therefrom, we have not yet sufficient data on which to declare anything very definite. The *probability* is that it arrives much the same time as does the Fantail and also departs with that bird, possibly arriving a little later and never staying on quite so late as the latest Fantails and Pintails do. Mr. Stoney's records are the only ones we have upon which one can work out a theory of any value. During the ten years these records cover, he notes, the earliest Pintail as being shot on the 27th August and the average date of the first bird as about the middle of October. The Fantails also arrived in early October, but no Jack Snipe were shot until the 3rd of November. Whereas, also, his last Pintails and Fantails were shot in April, the last Jack was killed on the 10th March.

The Jack Snipe is a very particular bird in his choice of an abode, and when shooting over a large tract of country the sportsman will find that but few spots are affected by the Jack,

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but that these few places are resorted to again and again, by the same bird if it is missed when first put up, or by another if the original occupant is killed. Hume's description of this little snipe's favourite haunts cannot be improved upon, and I again indent on that much-quoted author. He writes:— "Now, these pet abodes have a character of their own; they may always be correctly described as *corners*, sometimes they are corners of paddy fields, surrounded on two out of three sides by a low earthen embankment; sometimes they are in an angle formed by a little scrub, or a couple of bushes, often just at the corner of a bed of bulrushes or high reed; they are always sheltered in secluded spots, where the ground is thoroughly moist or marshy and where the cover is pretty high."

This curious affection for 'corners' exhibited by the Jack Snipe struck me very forcibly when shooting in Cachar. Our ground was a vast expanse of rice cultivation interspersed here and there with higher land, here and there with deeper pools or stretches of swamp, but for the most part dead-level riceland stretching field after field in every direction. In places, however, small patches of land had been left uncultivated, and in these patches, generally extra swampy and muddy, grew a dense, bushy grass mixed with weeds, always thicker and higher near the banks which divided the uncultivated patch from its neighbours. It was in these places that we found the Jack Snipe, and we noticed also that they rose almost invariably from the corners where the vegetation was most rank. Shooting over this ground in the morning we put up Jack, sometimes two or three, out of each of these scraps of grass which we worked through, sometimes killing, sometimes missing. Returning again in the afternoon over the same ground, the same thing occurred, and that whether we had missed or killed in the morning. We shot over these fields on three consecutive days and each day we must have put up from 15 to 20 Jack Snipe killing about 10 of them. As far as I remember on no single occasion did we put up a Jack from the ordinary cultivated rice land, though we bagged one or two from corners of the swamps and in cosy little jungly corners running up into the higher land.

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As a rule the Jack sits very close and requires a good deal of persuasion to make it rise. Nor does it run after alighting as the Common Snipe so often does, and if after being flushed it again settles, it will, if looked up at once, be found at the exact spot where it has dropped. It is said to have an extremely strong smell, so that shooting with dogs, as at home, Jack are not often passed over, but out here, where dogs are, and can be, but seldom used, many Jack must be passed over as they lie snug in their cover.

Jack rise silently and very vertically, and once up and away, their flight is exactly like that of a butterfly. It may be slower than that of either the Pintail or Fantail, but it is a very disconcerting bird to fire at after one has been shooting for some time at the bigger birds. Hume says that it is probably one of the easiest bird in the world to shoot if you reserve your fire to the proper moment, but I must personally confess that I have never yet quite made up my mind as to which this proper moment is. The bird's whole flight is so erratic that one can never tell what its next movement is going to be; it rises, drops, dodges to one side or another irrespective of all ordinary rules of flight and then when you think it has steadied down to a flight in one definite direction, it falls to the earth as if already shot, and you then walk it up to have the same performance repeated.

Directions as to how to shoot the Jack Snipe are plentiful, and two may be quoted. Booth says:— "A Jack Snipe . . . . was almost invariably missed through firing too quickly, and . . . . I was forced to repeat aloud one, two, three, four, five, six before bringing my gun to the shoulder . . . now . . . ill-luck invariably attends the bird that is patiently waited for."

Colonel Hawker, however, gives the following advice:—"Nothing teases a poking shot worse than a Jack Snipe, but to one who has the knack of pitching and firing his gun in one motion, they are generally speaking not much worse to shoot than other small birds."

Its curious flight seems also to be too much even for the powerful winged birds of prey, for Finn records that Mr. Jesse "recently saw one pursued by quite an assortment of Raptorial birds, and

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yet evade the whole villanous combination, which included a pair of Lugger falcons, two kites, a tawny eagle and two ruffians unidentified."

It is however a gamey little bird well worth expending one or more shots on, as there is no daintier morsel of food obtainable than a Jack Snipe, generally a little ball of fat and in flavour excelling any of his larger relatives.

The Jack Snipe has been accused of being unable to swim, but this is quite incorrect, for I have seen a winged Jack fall into a clear pool in a swamp, right itself at once and swim straight to the edge where it promptly concealed itself in the weeds.

The Jack Snipe breeds from the Atlantic to the Pacific throughout Europe and Asia in the far North and is perhaps most common during the breeding season in Finland, where its nests were first taken by Wolley. Buturlin found it numerous on the Kolyma Delta in 1905. It is reported to breed in considerable numbers throughout Russia, north of the latitude of St. Petersburg and extends throughout Northern Europe to Great Britain, in which country it is said to have bred or been shot in the breeding season, as far south as Yorkshire.

During the breeding season the Jack Snipe makes a curious sound whilst on the wing, but it is very doubtful whether this sound is "drumming" in the true sense of the word and the best observers still consider the sound a vocal one.

Dr. Bahr thus writes about *Gallinago gallinula* "The Jack Snipe has 12 tail-feathers, of which the outer three are markedly shorter than the three central ones. Their texture is soft and the rami are easily separated, in contradistinction to those of the species we have already considered. On experiment these feathers produced no sound at all.

"The structure of the outer web of the outer feathers more nearly approaches that of the inner—a marked difference to that found in the other feathers we have been considering; that is, the rami of the outer web are provided with distal and proximal rows of radii and thus adhere together. The distal radii are provided with 4 hamuli both in the outer and inner webs."

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Buturlin writing to Dr. P. H. Bahr on the "drumming" of the Jack Snipe says:—"I heard it every day in the summer of 1905, when on the Kolyma. The bird usually flies so high that even with the aid of the midnight sun and good Zeiss binocular it is often quite invisible, nevertheless the sound 'top-toppy, top-toppy' is quite clearly heard."

Wolley's description of the breeding of this little Snipe still remains the best and the most interesting and is therefore quoted *in extenso*. He writes: "I scarcely like to tell you about the Jack Snipe; anything I can say must be so poor an expression of my real exultation at the finding of this long-wished-for egg. It was on the 17th of June 1853, in the great marsh at Muonioniska that I first heard the Jack Snipe, though at the time I could not at all guess what it was. An extraordinary sound unlike anything I had heard before. I could not tell from what direction it came, and it filled me with a curious surprise. My Finnish interpreter (Theodore) thought it was a Capercally, and at that time I could not contradict him; but soon I found that it was a small bird gliding at a wild pace at great height over the marsh. I know not how better to describe the noise than by likening it to the cantering of a horse in the distance over a hard hollow road: it came in fours, with a similar cadence and a like clean yet hollow sound. The same day we found a nest which seemed to be of a kind unknown to me. The next morning I went to Khartouoma with a good strength of beaters. I kept them as well as I could in line, myself in the middle, my Swedish travelling companion (Herr Salomon) on one side and the Finn talker on the other. Whenever a bird was put off its nest the man who saw it was to pass on the word, and the whole line was to stand whilst I went to examine the eggs, and take them at once, or observe the bearings of the spot for another visit, as might be necessary. We had not been many hours in the marsh when I saw a bird get up before Herr Salomon, and I marked it down. In the meantime the nest was found, and when I came up the owner was declared to have appeared striped on the back and not white over the tail. A sight of the eggs, as they lay raised my expectations to the

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highest pitch. I went to the spot where I had marked the bird, put it up again, found that it was indeed a Jack Snipe, and again saw it after a short, low flight drop suddenly into cover; once more it rose a few feet from where it had settled, I fired and in a minute had in my hand a true Jack Snipe, the undoubted parent of the nest of eggs. I walked as composedly as possible back to my friend; he said: "A common bird, I suppose?" I replied "yes, very"; but I shook him warmly by the hand and told him that common birds sometimes lay very rare eggs. As usual I took measures to let the whole party share in my gratification before I again gave the word to advance. In the course of the day and night I found three more nests, and examined the birds of each. One allowed me to touch it with my hand before it rose, and another got up when my foot was within six inches of it. It was very fortunate that I was thus able satisfactorily to identify so fine a series of eggs, for they differ considerably from one another. I was never afterwards able to see a nest myself, though I beat through numbers of swamps. Several with eggs, mostly hard sat upon, were found by people cutting hay in boggy places in July. I have spent a good many hours this present year (1854) in the same Kharta-uoma without finding one, though I had plenty of men and boys in good working order. There have been certainly few Jack Snipes in the country this season. The nest of the 17th and the four of the 18th of June were all alike in structure, made loosely of little pieces of grass and *Equisetum* not at all woven together, with a few leaves of the dwarf birch, placed in a dry sedgy or grassy spot close to more open swamp. I found them generally at the best time for finding birds by walking them up from their nests, that is in rainy weather or about midnight. The gnats are, however, there so terrible voracious—destructive—no word is too strong—that tar oil, Templar caps, veils and thick leather gloves are indispensable.

"It was not long after I first heard it that I ascertained that the remarkable hammering sound in the air was made by the Jack Snipe; but I have not yet quite satisfied myself whether the *keet-koot keet-koot* on the ground, and the *Baa-aa-aa* in the air, which

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are constantly to be heard in the same place, are made by one and the same bird at different times. At a considerable height it is not easy to distinguish a Jack Snipe from another Snipe, and the clicking and bleating seem to my ears exactly like the Common Snipe's. However, I did not find a single one of the latter bird in Iso-or Kharto-uoma, though I have met with one or two elsewhere in the neighbourhood. Few of the country people recognise two kinds; they consider that all the sounds proceed from the same bird, the "Ram of the Heavens"; they take them for signs of the weather, or they adapt them to words pretending to be the lamentations of transmigrated girls, who have died in their maidenhood and are bewailing their hard fate; but the lads generally get the worst of it in a trial of wit with their fair companions."

"(The above, written by Mr. Wolley from Muonoiovara, 27th November 1854, to Mr. Hewitson, was by him printed, with a few omissions (now restored) in the Third Edition of his work.")

"Mr. Wolley," adds Prof. Newton, "subsequently satisfied himself that the Jack Snipe did not bleat in the air or utter the *keet-koot* call-note on the ground, those noises being exclusively due to the common species; but both are called indifferently the *Jeivaar Jaure*, meaning the 'Ram' or, I believe, more strictly, the 'Wether of the Heavens.'"

The Jack Snipe commences breeding a good deal later than the Fantail, and appears seldom to lay before the end of May, though I have a clutch or eggs taken in Finland on the 21st of that month. The majority of birds do not lay until the second or even third week of June and eggs may be found (*vide* Wolley above-quoted) until well on into July. Naturally the further North the breeding grounds the later the Jack Snipe lays, and in the most Southern portion of its breeding area, late eggs of *Gallinago cœlestis* may be taken on the same ground, and at the same time as the earliest eggs of *Gallinago gallinula*.

The nest consists merely of a few blades of grass, weeds or leaves in some natural depression in the ground, but in a few instances they are said to collect together a considerable amount of material, more especially when the site selected is a wet one.

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As a rule, the nest is placed in some wide-stretching fen on a small tussock or patch of ground slightly higher than the surrounding fen-land, and several pairs of birds may be found breeding on the same swamp. Sometimes, however, the Jack Snipe lays its eggs at a considerable distance from any actual swamp, and they have been found in hay-fields or in strips of grassland which contain soft and muddy patches.

The full complement of eggs laid is always four, as with other snipes, and the eggs themselves are typical snipes' eggs in shape, colouration and texture, but are extraordinarily large in proportion to the size of the bird. A hen Jack Snipe after laying her last egg, seldom weighs more than 2 oz., yet the weight of the four eggs is, roughly speaking, about an ounce-and-a-half.

As regards the few eggs in my collection, I can see no difference in colouration between the eggs of *Gallinago cœlestis* and those of *Gallinago gallinula*, but it has often been claimed for the latter that they are more richly coloured on an average, and this may be the case when a large series is taken into consideration. The ground colour is generally a yellowish stone colour, often tinged with green or grey, or, less often, with reddish and the markings consist of broad blotches and spots of deep brown, many almost black, with others underlying them of dark purplish grey. Occasionally these secondary markings are paler and more washed-out in character and are then rather a lavender than purple-grey. The markings, both primary and secondary, are generally more numerous at the larger end, being sometimes almost entirely confined to this. In one pair in my collection, which comes from Finland, the blotches form a broad ring about the larger third of the eggs, the markings on the smaller two-thirds and inside the ring being but few in number and very small.

The texture is smooth and close, and usually there is a decided gloss ; the shape is the ordinary pyriform or peg-top.

Oates gives the measurement of the Jack Snipes' eggs as varying between 1·4″ and 1·65″ in length and between 1·05″ and 1·13″ in breadth. Dresser gives the average as 1·55″ by 1″·05″, and those in my collection average 1·52″ by 1·09″.

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Genus Rostratula.

The genus *Rostratula* is perhaps more nearly allied to certain of the Sandpipers than to the true snipe, and is certainly nearer the former in anatomy. The bill is long, as in the Snipes, but is curved gently downwards, and is swollen at the tip, and the upper mandible does not overlap the lower as in *Gallinago*. The retractile muscles are also absent, so that in the dry bill no pits show, though both mandibles are grooved. The eyes, though very large and snipe-like, are placed well forward; the legs are rather long and very sturdy, the toes long and the tibia naked for some distance above the joint.

The general plumage is more lax than in the snipes and the wings are broad, but rather short. The tail contains 14 feathers. The sexes are quite different in plumage, whilst the windpipe of the female Painter is longer than that of the male and curves into one full loop.

The genus contains three species, our Indian bird, which also extends to Africa and two others which inhabit Australia and South America respectively.

The sportsman can confound the Painted Snipe with no other bird; for, as soon as it is in his hand, he sees that it is a snipe or snippet of some kind with wonderfully painted plumage; and there is no other species of the *Charadriidæ* which can compare with it in colouration, though some of the Sandpipers in their rufous breeding plumage are very handsome.

Rostratula capensis.

The Painted Snipe.

Scolopax capensis.—Linn., Syst. Nat., i., p. 246 (1766).

Rostratula capensis.—Vieill, N. Hist. Nat., vii, p. 1; Sharpe, Cat. B. M., xxiv, p. 683; *id.*, Hand. L., i., p. 167; Oates, Game Birds, ii, p. 489; Finn., Ind. Waders, p. 155; Blanford, Avi. B. I., iii, p. 293; Stuart Baker, Jour. B. N. H. S., xii., p. 501; Bourdillon, *ibid*, xvi, p. 10; Macdonald, *ibid*, xvii, p. 500; Oates, Cat. Egg. B. M., ii, p. 68.

Rhynchæa capensis.—Butler, Str. F., ix, p. 428; Legge, B. of Ceylon, p. 800; Reid, Str. F., ix, p. 69; Hawkins, *ibid*, p. 172;

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Davidson, *ibid*, p. 320 ; Oates, B. B. B., ii, p. 386 ; Hume, Str. F., xi, p. 322 ; Seebohm, Charadriidæ, p. 456 ; Oates, Hume's "Nests and Eggs," iii, p. 350 ; Munn, *Ibis*, p. 894, p. 73.

Rhynchæa bengalensis.—Gray, Cat. Nepal Pres. Hodg, p. 140 ; Blyth, Cat. B. Mus. A. S., p. 273 ; Jerdon, B. of In., iii, p. 677 ; Stoliczka, J. A. S. B., xxxvii, p. 20 ; King, *ibid*, p. 217 ; Hutton, *ibid*, xvi, p. 790 ; Hume, "Nests and Eggs," p. 586 ; *id*, Str. F., i, p. 235 ; Adam, *ibid*, p. 396 ; Ball, *ibid*, ii, p. 431 ; Oates, *ibid*, iii, p. 346 ; Blyth and Walden, B. of B., p. 157 ; Butler, Str. F., iv, p. 15 ; Fairbank, *ibid*, p. 263 ; Hume, *ibid*, v, p. 46 ; Butler, *ibid*, p. 223 ; Hume and Davis, *ibid*, vi, p. 459 ; David and Wen., *ibid*, vii, p. 89 ; Ball, *ibid*, p. 228 ; Cripps, *ibid*, p. 302 ; Godwin Aus., J. A. S. B., xlvii, pt. II, p. 21 ; Butler, Cat. Birds of Scind, p. 61 ; *id*, Str. F., vii, p. 187 ; Ball and Hume, *ibid*, p. 228 ; Cripps, *ibid*, p. 302 ; Hume, *ibid*, p. 484 ; *id*, Cat. No. 873 ; Hume, Str. F., viii, p. 112, 957 ; Doig, *ibid*, p. 371 ; Butler, Cat. B. S. Bom. Pres., p. 76 ; Hume and Marsh, Game B. of In., iii, p. 381 ; Vidal, Str. F., ix, p. 84 ; Bingham, *ibid*, p. 197 ; Davidson, *ibid*, p. 230 ; Dawson, *ibid*, x, p. 414 ; Murray, Fauna, Scind, p. 242 ; Barnes, B. of Bom., p. 347 ; *id*, Jour. B. N. H. S., i, p. 59 ; *et*, vi, p. 130.

Vernacular names.—Ohari, Nepal ; Kone, Konebatta, Singhboom ; Tibud, Pan-lawa, (Mahrati) Ratnagiri ; Mail-ulan, (Tamil) Madras ; Baggajee, (L. Bengal) ; Rajakaeswatuwa, (Cing.) ; Daonidap Gajao, (Cachari.)

Description.—Adult male.—Crown olive-black, with very fine bars of white and a broad medium band buff ; feathers round the eye and short, but broad, streak behind it, over the ear-coverts, buff, the feathers next the buff darker than elsewhere on the head ; lores grey brown, very finely barred with black and more or less stippled with white. Upper back and scapulars a more olive brown with patches of dark metallic olive green and the outer webs of the scapulars buff, forming two lines down the sides of the neck similar to those in true snipes ; lower back, rump and upper tail coverts a vinous grey, very narrowly barred with black and with a few white dots, the last named also with buff circular spots ; tail the same with buff edges to the tips. Wing

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coverts and inner secondaries metallic olive-brown, finally barred with black, and buff and with broad buff bars and spots on the outer part of the wing; quills blue or vinous, grey finely barred with black, the outer primaries with broad alternate bands of black and buff on the outer webs, the inner primaries and secondaries with broad buff marks only, which become oval spots on the inner secondaries. Chin and neck mottled brown and white; breast and flanks brown, the latter mottled with white and the breast edged with dark brown next the abdomen which, with the under tail coverts, is white; a buff or white band passes up from the breast to form a shoulder girdle which connects with the buff scapulary lines, the borders to this band are black or darker brown than the adjoining parts. Under wing-coverts vermiculated grey, black and white; axillaries pure white and there is a broad white band formed by the tips of the medium under wing coverts.

"Length, 9·25 to 10·0; wing 4·9 to 5·2; tail from vent 1·5 to 1·8; tarsus 1·65 to 1·83; bill *at front* 1·65 to 1·85; weight 3·5 to 4·9 oz." (Hume).

"The legs and feet are generally greenish, usually a pale yellowish green, or greenish yellow, often greyer and duskier, or somewhat hoary on the joints and toes; sometimes however they are a deep olive, sometimes pale bluish overlaid with a greenish tinge, and sometimes simply dull pale green; the claws are brown, sometimes paler, sometimes darker.

"The irides vary from hazel to very deep brown, and have sometimes a greenish or olive tinge.

"The bill is very variable; typically it is a pale fleshy brown, darker or purer brown towards the tip, and with a greenish tinge towards the base; it is subject however to a good deal of variation" (Hume).

The above description of the soft parts as given by Hume refers to both male and female.

Adult female.—The circle round the eye and the band behind it are pure white. The chin, throat, neck and extreme upper breast a rich chestnut, with a broad pectoral band of blackish brown running up as far as the scapulars and succeeded by a pure white band which is again followed by another brown band, intercepted

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in the centre with white; the scapulars and back have not the buff markings of the male but the underlying scapulars are pure white, forming a tuft of white feathers which show up through the others. The wing-coverts and inner secondaries are a rather bright olive green closely barred with black and more or less tinged reddish. The general aspect of the closed wing is thus green in the female whilst it is a game-bird vermiculated brown in the male. The remainder of the plumage is like that of the male.

"Length 9·75 to 10·89; wing 5·25 to 5·6; tail from vent 1·6 to 2·0; tarsus 1·75 to 1·96; *bill at front* 1·8 to 2·05; weight 4·4 to 6·42 oz." (Hume).

"Bill greenish, yellow fleshy at the tip of both mandibles; feet pale green; iris dark drown" (A. E. Butler).

"The bill is olive brown throughout in the cock, in the hen brown at the base shading into flesh colour at the tip" (Finn).

I have not personally been able to discriminate between the sexes as regards the colouration of the soft parts and think the variations are individual and not sexual.

"The young birds of both sexes resemble the male in plumage *but the female may be known at all stages by the presence of some white scapular feathers*. Females in every phase of plumage between that of the male and that of the adult female are very common in collections" (Oates).

"*Young male.*—Resembles the old male almost exactly, but has the throat entirely white, the lower throat and fore neck washed with brown, with some dusky streaks" (Sharpe).

Young females who have just acquired adult plumage have the chestnut of the head and neck very dull and the feathers are margined with dusky.

Nestling.—Dull grey, or buff grey, with a broad coronal streak and eye streak of rich brown. The centre of the back is rich rufous with a band of black on either side and there are also lateral bands of purplish brown, running from under the wings as far back as the thighs. The wings are banded buff and brown.

There is no seasonal change of plumage in the female.

Distribution.—Africa, South of the Sahara, but extending East to Egypt, Madagascar; throughout Southern Asia, though it

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appears to be very rare, if existing at all, in Arabia and Persia; in all parts of India, Burmah and in the Malayan Peninsula, throughout Southern and Central China to Japan and also in Sumatra, Java, Borneo, Philippines and Formosa.

In India it is to be found in practically every part of the Continent where there is suitable country for it and, in the same way, it is to be found at a considerable elevation in the Himalayas and other mountain ranges where there are swamps, lakes, etc., for it to live in. In Kashmir it is often met with as late as September, but seems to migrate to lower elevations in the winter. In the Khasia Hills it is found upto 5,000 feet in summer and up to nearly 2,000 feet in winter. I have also records of its ascending the Nilgherries to about the same height and in Travancore it seems to be found up to 3,000 feet as I have had eggs sent me for identification taken at that elevation.

Naturally, though not migratory in the true sense of the word, the Painted Snipe, being dependent on a water supply, becomes locally migratory in those places in which the water at one season completely dries up. Thus, Adam reported that in the vicinity of the Sambhur Lake, the birds were only seen during the rains but migrated elsewhere in the approach of the hot weather when the lakes dried up. Reid and others note that they are more or less migratory in the Lucknow Division; and, doubtless, this local migration obtains in many of the drier portions of the N.-W. Provinces, Oudh and Rajputana. Hume thought that an excess water supply, such as is found in Lower Bengal, also affected their movements; but this is probably not the case, as they have been shot, and are common, at all seasons of the year in the Sundarbands, the most watery of all parts, even of watery Bengal.

Nowhere within its habitat is the Painted Snipe ever found in such vast numbers as is the Common Snipe; but in certain parts of the country, such as the Sundarbands of Khulna and Jessore, some 30 or 40 birds may be seen in a day's trudge; and this although the birds do not *pack* in these districts as they are said to do elsewhere. Thus in Stray Feathers Butler speaks of whisps or flocks of 20 birds, and Hume in *Game Birds* records that he has seen flocks of a dozen or more birds together at the same time.

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The Painted Snipe scarcely deserves a place amongst the Game Birds; if in anatomy he is more near the sandpipers than the snipe, in many of his habits and manners he is nearer the rails than to either the sandpipers or real snipe. Hume, with his powers of accurate observation, of course noticed this, and gives a very characteristic little anecdote to illustrate it. He writes :—"On one occasion . . . . I saw three running about on a tiny patch of short, close moist turf, just outside the rushes and not 20 yards from where I was, and picking up something rapidly from the ground. After watching them for several minutes, I made a slight clicking sound, and they instantly sneaked into cover with lowered heads." I was once staying in a house in the garden hedge of which a pair of Whitebreasted Water Rails had their nest. When all was quiet, the two adult birds, and later on the parents with their brood, used to come out and wander about on the lawn; directly, however, they found out that they were being watched simultaneously down went the 8 heads of parents and children, as if suddenly filled with the deepest shame, and they all sneaked off into the shelter of the hedge. If they were disturbed by a dog they took to their wings, and here too they showed how closely the Painted Snipe is like the Rails. Both birds fly in exactly the same manner, though the larger wings of the Painter flap more slowly and laboriously. In starting both Rail and Painted Snipe drag their legs as if it was an effort to lift them up and for some yards after they get under way, the legs hang and then, with an effort, are pulled up and tucked away in proper position under the tail.

This bird, as a rule, haunts swamps, old watercourses and even ravines and banks of running rivers where there is ample cover; a long day's shoot in rice-fields is not likely to produce a single bird, though where there are adjacent marshes with thick vegetation, these may contain them in numbers. Even, however, in the larger stretches of water frequented by them, they seem to haunt special patches more than others, apparently preferring those which combine pools of water of some depth with plenty of soft, muddy land covered with a tangle of vegetation.

Such patches as these they are very loth to leave; they refuse to rise, unless closely pressed and soon return after the cause of their

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disturbance has gone. Even, when shot at and missed, they may often be found again in exactly the same place within a very few hours, and this may occur several times before they are induced to quit.

A curious exception to this predilection for thick cover came under my experience in Cachar, where both Mr. H. A. Hole and I found these birds in July and August very numerous in recently ploughed fields. Painted Snipe are very common in Cachar, and especially so in the many bheels which run along the foot of the North Cachar Hills. The ploughed fields where we found the birds were small in area and consisted of the narrow strips of level ground which ran up into the foot Hills themselves, whilst the other ends terminated in swamp or jungle. The fields had in these months no crops yet growing on them and though often surrounded with jungle were quite bare themselves, except for the small amount of vegetation growing in the boundary ditches. Nor were these fields muddy and moist, except after heavy rain, though there was generally water in the ditches, yet the birds appeared not only to live and to feed in the fields but to make their nests in the ditches instead of in the swamps as would be expected.

The Painted Snipe is a strong, sturdy walker, and when, as is often the case, it inhabits cane bushes, beds of reeds or extensive jungle, it will often run great distances when it alights after being flushed. It is also an excellent swimmer, and I once saw an unwounded bird, disturbed by the near approach of a line of shooters, slip into a wide ditch of clear water and swim to the opposite side. Wounded birds have often been seen to swim either to escape capture or when shot at and dropped in open water. Legge also, quoting Layard, writes about two young Painted Snipe:—"On his giving chase, the chicks took to the water and swam like ducklings."

Finn in his "Indian Waders" has much to tell us of interest about this bird in captivity, and his remarks must be quoted at length. He writes:—"I have kept many and found them not very lovable pets. The words used by Palgrave to describe the camel's character will describe the 'Painter' exactly, 'never tame, but not wide-awake enough to be exactly wild.' I once even reared

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a half-fledged young bird and got no further towards conciliating it then I did with adults. Yet these will let one pick them up with far less trouble than much tamer birds would give. In captivity can be studied with advantage the curious display by which the species seeks to terrorize an enemy. When slightly alarmed, it raises the wing furthest from the intruder; if pressed, this wing is fully expanded, while in desperation the bird faces its adversary with both wings and tail spread so that their beautiful spotted markings are fully shown. Meanwhile, a hissing or swearing note, like hot iron plunged into water, is given off. The similarity of this last attitude to that adopted by owls when on defence is, however, very striking, and I believe the Painted Snipe is at least as nocturnal as most owls, judging from the behaviour of captive specimens. Like owls, also, this bird has a singularly expressive countenance. When in its ordinary diurnal attitude crouched against the wall of its prison, with tail up and head down, so as to look as much as possible like a lump of mud, the head-feathers all lie flat, giving their owner a singularly stupid appearance. On the rare occasions, however, when one sees the bird walking about at ease, the feathers over the eyes are raised so as to be higher than the crown, which gives quite a wide-awake expression. In moving about thus, the head is carried high, and the bird looks tall and graceful, and moves its hind quarters up and down like some Sandpipers, but much more slowly. It will search for food in water something like a Spoonbill, and can swim, but this latter is not an exceptional accomplishment, being common to waders generally. The spreading of the wings undoubtedly has a terrifying effect in some instances, as I have seen a Golden Plover frightened by it, as also a Bantam hen; but some birds—a Rail, Ruff, and Pitta, did not seem alarmed at the Snipe's demonstrations. I was told, however, of a Squirrel which was seen to be scared thereby, when it came across one of these birds in one of the aviaries in the Calcutta Zoo, and I know of a case in a private aviary where a 'Painter' escaped destruction when some other birds were killed by a rat. It seems, therefore, that this gesture is a protective one. At the same time I have no doubt that the natives who told Mr.

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Hume that the birds showed off to each other in this way in the breeding-season were quite correct in their statements, as I have more than once noted cases in which various birds used the same gestures to express anger or fear as they display in courtship."

Finn in the above quotation says that he thinks these birds must be as nocturnal as owls and Hume says that they certainly move about much more at night than by day. It is probable, however, that they feed freely in the early mornings and evenings and are crepuscular rather than nocturnal in their habits. Certainly Mr. Hole and I found them constantly feeding in the ploughed fields I have referred to already during all excepting the hottest hours of the day when they retired to the ditches and were only roused with great difficulty.

They are very omnivorous in their diet and eat both grain and animal food. An examination of the stomachs of a fairly large series of birds has given the following mènus of a Painter's daily fare. On many occasions exclusive meals of fat little field crickets, sometimes the same mixed with grass seeds or, less often, with unripe paddy; often meals of many courses including snails and tiny shell-fish, worms of all sorts and sizes, grass-hoppers, seeds, paddy and rarely millet. At other times they seem to have taken nothing but vegetarian food and once or twice I found nothing but paddy in their stomachs mixed with the green blades of paddy leaves.

The crickets were found in the stomachs of those which had been feeding in the open fields and it may have been the extraordinary abundance of these insects which induced the birds to forsake their ordinary habits and haunts.

I have remarked in the beginning of this article upon the difference in the length of the trachea of the male and female Painted Snipe, the latter having it long and convoluted and the former shorter and straight. This appears to correspond with a difference in voice and we find that the female has a rather deep, mellow note contrasting with the squeaky note of the male. Finn says he has noticed no difference in the notes of the two sexes, but says nothing further.

Wood-Mason describes the call of the female as "a low, regular, hoarse, but rich purr," Tickell considers it "low and mellow, a

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single soft note frequently repeated, kone, kone, kone," and Hume says that to his ears it "most resembles the sound produced by blowing into the neck of a phial." Hume's description of the call seems to me to describe it well, but the reader must not imagine that the note is a whistle. A strong blow into the neck of a phial of course produces a whistle, but the call of the female Painter resembles the blow when it just falls short of this. It is a common enough call and every sportsman must get to know it if he does much snipe-shooting as the birds repeatedly call up to 9 or 10 A.M. in the cold weather and again commence calling in the evening a hour before sunset.

There is, I think, little doubt, but that, like the bustard-quails, the female Painted Snipe is polyandrous, and that like the bustard-quails also, it falls to the lot of her many husbands to hatch and rear the young. There are many points about their habits which have led me to this belief. Reference has already been made to the parties, or flocks, of these birds which certain observers have recorded as having seen. Now in every case in which such records have been made (Butler who recorded female flocks afterwards corrected his statement) the person recording it has stated that these parties consisted entirely of males, that is to say, of birds in the male plumage. Hume says that the larger of such flocks as he has seen have appeared to him to consist of two or more families of parents and young, but again it will be noticed that he makes no mention of any bird in the female garb and indeed infers, by the context, that they were all in the male plumage. It appears therefore that these parties consist of one or more adult cocks with their young and the only inference we can draw from this is that the cocks are left to look after the nestlings and bring them up.

As regards the hatching of the eggs, all I can say at present is that every bird that I have shot off the nest, or have had sent me as being trapped or shot off the nest, has been a male. Hume writes on this point "in no less than three cases in which old birds have to my knowledge been captured on the eggs, such old birds have proved to be males."

Against this theory is Capt. E. A. Butler's experience which

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appears to be that both birds take part in incubation. He says in describing the nidification, that "the old birds are almost always near the nest" and all through this note he uses the plural number for the parents although he does not definitely say that he has ever shot a female off the nest, though in one paragraph he speaks of the bird as a female. The conclusion I have arrived at that the male alone carries out the duties of incubation has been further corroborated by other observers and sportsmen, some of whom did not even know that the more gaudy bird of the two was the female, and had, until they were told this, stoutly asserted that the female always sat on the nest and the male never. The fact that the female of the two sexes is provided with the more powerful voice apparatus and does the calling, to which it must be presumed the male replies in person, certainly looks as if she were the dominant factor in their matrimonial arrangements.

Yet again we find that the breeding season of the Painted Snipe extends practically the whole year round, ceasing in different localities only when the state of the country renders the food supply precarious, and when the scanty meals and constant work necessitated to obtain even these suffice to quell for the time being all desires to nest. Now this continuous laying of eggs by the female would prove far too great a strain on any bird's constitution if the time between the laying of each clutch of eggs was taken up in hatching them and then rearing the young but, given this time in which to recuperate, each female might well lay four or even more clutches in the year. Doubtless, too, sportsmen have noticed that they kill two or three adult males to every adult female and this fact, that the males should be far more numerous than the female, is what is to be expected in a polyandrous species.

There is also some proof that the females fight for the possession of the males for the Cachar Mahomedan Shikaries, who reverse the sexes, all say that the males are great fighters and constantly fight over the females.

Nidification.—The breeding season of the Painted Snipe begins on the 1st of January and ends on the 31st December, being shortened, as already mentioned, merely by local limitations, such as failure

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of water-supply and consequently of suitable habitation and, to a less extent, of sufficient food. In places where there are swamps well supplied with water and cover all the year round we shall find that eggs of the Painted Snipe may be found during any month of the twelve, being naturally most numerous during those months in which the food supply is most plentiful and the birds are consequently in the best condition.

Legge says in Ceylon—the evergreen—that this bird breeds throughout the year and he mentions having records of eggs or young in every month of the year except January, February, August and October. As, however, he got an oviduct egg on the 31st December and young birds in March his records practically cover the whole year.

In Cachar and Sylhet it is the same, though but few birds breed in March and April when water is comparatively scarce; in the Sunderbunds they breed all the year round but seldom in August and September when their favourite breeding grounds are flooded.

Almost any site near water will do for a Painted Snipe's nest. It may be a tiny isolated pool with a few sedges and a sheltering bush or it may be some equally tiny islet just above flood level and placed in the middle of a sea of water and jungle stretching for miles on every side. I have taken them from dense tangles of cane and jungle growing on the borders of the morasses which stretch, in their lonely wildness, for miles along the foot of the Himalayas far from all signs of civilization, and I have taken a nest from a ditch actually in the station of Silchar and within 30 yards of an house. Nor is it necessary that the nest should be placed in uncultivated swamp land, for in parts of India it is often found (*vide* Butler) in or near rice fields. He writes: "The nests, all of which were in the vicinity of rice fields, were, in most instances, on the ground; but in one or two cases they were raised as high as eight or ten inches from the ground, and supported by the grass in which they were built.

"Of the various situations they were found in, I may mention as one of the most common the raised foot-paths which so often intersect these rice fields. In the rains the sides of the path become overgrown with grass, and in this grass the nest is often

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built. Another favourite place is the short, dark green rushy grass that grows by the side of tanks and in swampy ground. This perhaps is the most favourite place of all, and in many of the nests found in this situations, the blades of grass were drawn together over the top of the nest, so as to form a sort of canopy as in some nests of *Porzana akool*. Another favourite spot is a rice field which has been ploughed up and left unplanted for some time until the grass begins to grow over it."

It does not always wait, however, ever until the grass has begun to grow, for during three seasons Mr. H. A. Hole found nests placed in fields which had been so recently ploughed that there was practically no growth on them and the nest had been placed merely under the shelter of a clod of earth larger than the average. Two or three such nests were shewn to me by him and others I myself found when staying with him. Some nests, the majority perhaps, were placed in the jungle which covered the sides of the ditches, but a very large number were taken from the bare fields well away from the sides. A very curious fact we noticed here was that we repeatedly came across single eggs dropped casually by the hen bird on the ground with no sign of a nest and, apparently, with no thought for its incubation.

The nest itself is a fairly compact pad of grass, straw, rushes or weeds, measuring about 6″ across and from one to three inches in depth. When placed in a deeper hollow than usual the nest may be almost cup-shaped, but as a rule is merely a flat pad which has a depression less than an inch in depth. It is nearly always placed actually on the ground but occasionally a few inches off it in a tuft of grass thicker than usual, even more rarely, it may be found placed on a tangle in a cane brake just above the water or mud. Nearly always a wet situation is chosen or one just close to mud and water, but this is not invariably so and, as already narrated, I have taken nests from quite dry fields some distance from any water or wet ground. So also, though most nests are fairly well concealed by cover of some sort, others are placed conspicuously in the open or in stunted grass or stubble in positions in which it seems impossible they should escape the unwelcome attentions of vermin, winged or otherwise.

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The number of eggs laid is almost invariably four, five is an abnormal clutch and three only quite exceptional.

They are very beautiful but do not in the least strike one as being eggs of any of the Snipe tribe.

The ground colour is generally yellowish, ranging from a pale stone-yellow to a bright yellowish *café-au-lait*, the tint is nearly always bright and the dominant colour is nearly always yellow but the actual tint varies much and there may be a grey, green, olive or even a pink tinge in it. The markings are always very bold in character and generally consist principally of very large blotches with a varying number of specks, spots and lines of deep vandyke brown. The centres of the larger blotches and where they overlap one another are almost black, but the outer edges are sometimes paler and more of a sienna brown. The secondary markings are but few in number and of the same shape as the others, but in colour are a grey brown or sienna brown, more or less washed out in appearance.

In some eggs the superior markings are paler in colour than usual and now and then one comes across a clutch in which all the markings are a light sienna brown.

In all eggs normally marked, the markings are most numerous towards the larger end, often forming there an irregular cap, sometimes a broad, irregular zone.

I have one clutch of eggs in which the markings consist mainly of twisted lines, long and short, with but few blotches or spots. In this the ground colour is the usual yellow, but an even more abnormal clutch has the ground colour a pink, almost purplish stone colour with the usual markings of vandyke brown. This is a very beautiful clutch and I have never seen another at all like it.

In shape the eggs shew some similarity to Snipe eggs but are, what one might call, of a modified character, the true peg-top egg being quite exceptional and ordinary ovoid or elliptical eggs quite common. Between these two extremes eggs may be found in every shape, the slightly peg-top shape being the most common.

The texture is hard and close, but not so fine as in the eggs of *Gallinago* and though there is generally a slight gloss, and sometimes a good deal, they are on an average not nearly so glossy as

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the eggs of that genus, nor do they retain their fine surface and colouration for nearly so long a time.

All my eggs come within the limits of size given by Hume, 1″·29 to 1″·49 in length and from 0″·89 to 1″·05 in breadth, but the 120 eggs which I have measured average 1″·36 by 0″·97 as against his 1″·39 by 0″·99.

THE PLATE.—The colouration is on the whole good though our clever artist, Mr. Grönvold, may have been less happy than usual in clothing his birds in *feathers*. In fact the feathering of this bird should be more than usually pronounced as it is more lax and soft than in the true snipes.

Both bills and legs are correctly coloured but depict, of course, only one type. In most birds the legs will be found to be a less vivid green and with a decided touch of grey a plumbeous, more especially about the joints.

The female, which is shown in an active position, should have had the feathers above the white loreal patch slightly erected.

The white scapulars give one the impression in the picture of peering out from under the tertiaries or inner secondaries, as a rule, however, these show through between the upper scapulars and the adjoining wing coverts.

(To be continued.)

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"THE PALE WEASEL" OF BLANFORD'S "MAMMALIA" AND A NEW HIMALAYAN VOLE.

BY

R. C. WROUGHTON.

Capt. Whitehead has recently presented to the National Collection two specimens of a weasel taken by him in the Upper Sutlej Valley. On comparing these with other weasels in the collection it appears that they, together with a specimen taken by Dr. T. G. Longstaff which evidently is the same form, differ from any other described Indian weasel.

Blanford in his Mammalia (No. 84, p. 168) adopts the name *alpinus* (it has been definitely agreed to restrict the generic name *Putorius* to the Polecats, using *Mustela* for the Stoats and Weasels) for the pale weasel of Nepal, Sikhim and adjoining Thibet, which Hodgson gave the name of *temon*. *Alpinus* was originally described from the Altai Mountains; and specimens from that locality show that it is a distinctly larger and stouter animal than *temon*, judging by the skulls, for unfortunately no specimens with reliable body measurements are available. In colour *alpina* is much paler, above than *temon*, and fades gradually to cream buff on the belly, in *temon* the contrast between the two shades is more sudden, though not in all specimens, showing a defined line of demarcation. In the specimens from the Upper Sutlej Valley and Ladak the pale yellowish white of the belly is quite sharply demarcated from the colour of the back and flanks, and this last is much nearer to that of the pale *alpina* than to that of the darker *temon*.

Under the circumstances, it is clear that the name *alpina* must be restricted to the northern Mongal-Siberian form, that *temon* must be revived for the Nepal Sikhim species, and that a new name is required for Capt. Whitehead's specimens. I propose to call them—

Mustela longstaffi, sp. n.

A weasel of the *alpina* type with a stout skull, showing little sagittal crest in the male and a large swollen brain case.

Fur short and close (8-10 mm. on back). General colour above a pale shade of 'clay colour,' below pale yellowish white. Head

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slightly darker than tail, same colour as the back. Hands and toes white.

Skull stoutly made, the brain case much swollen, the sagittal crest not strongly marked, teeth less stout than in *alpina*.

Dimensions of the type recorded by the Collector:—

Head and body 250; tail 147; hindfoot 46; ear 25.

Skull.—Greatest length 50; basilar length 46; greatest breadth 28; post orbital constriction 10; brain case breadth 24 length of, carnassial 6; bullæ 14.

Habitat.—Western Himalaya (Type from Upper Sutlej, Valley Alt. 14,000).

Type.—Adult male. B. M. No. 10, 12, 2, 1. Original Number 168. Collected 16th September 1910, and presented to the National Collection by Capt. C. H. T. Whitehead.

At the same time as the weasel, Capt. C. H. T. Whitehead sent 3 specimens of a vole which, though closely resembling a species from Lhassa, differs from it in several skull characters and seems to deserve a name at any rate as a distinct Geographical Race. It may be described as follows:—

Microtus (*Phaiomys*) *waltoni petulans*, sub-sp. n.

A local race closely resembling *M. waltoni* externally. The latter, however, shows a well marked pale area on the flanks and its feet are distinctly whiter. Size as in *waltoni*.

Skull as in *waltoni* but more lightly built, especially noticeable in the lower jaw. Upper incisors narrower and white-tipped anteriorly; nasals shorter, extending less far back, broader in front, more abruptly narrowed backwards; anterior palatal foramina longer; bullæ smaller.

Dimensions of the type, taken in the flesh:—

Head and body 102; tail 33; hindfoot 16; ear 10.

Skull.—Greatest length 26·5; basilar length 23; zygomatic breadth 16; inter-orbital breadth 4; length of nasals 6·5; diastema 8·5; palatilar length 14; length of molar series 7.

Habitat.—Teza, Upper Sutlej Valley.

Type.—Young male. B. M. No. 10, 12, 2, 27. Original

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Number 165. Collected on 14th September 1910, by Captain C. H. T. Whitehead and presented to the National Collection.

Three specimens in all were taken but the skulls of the other two are much damaged, they are both older individuals. The skull characters I have noted above are quite constant in the three specimens so far as can be seen. The type locality of *waltoni*, Bonh. is Lhassa.

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A POPULAR TREATISE ON THE COMMON INDIAN SNAKES.

ILLUSTRATED BY COLOURED PLATE AND DIAGRAMS

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

Part XV with Plate XV., Plate A, 2 Diagrams and Map.

(*Continued from page 633 of this Volume.*)

BUNGARUS FASCIATUS.

THE BANDED KRAIT.

Proteroglyphons colubrines—or colubrines with tubular fangs in the front of the maxilla—are divided into two sub-families, (1) *Hydrophiniæ*—Sea snakes—all of which are poisonous, and (2) *Elapinæ*—poisonous terrestrial colubrines. The latter sub-family is divided into 69 genera, one of which *Bungarus* includes the species which forms the subject of this article. The genus *Bungarus* contains, according to my ideas, twelve distinct species, * but only six were described by Mr. Boulenger in his catalogue in 1896, and one subsequently by the same authority. The type of the genus is *Bungarus fasciatus*.

BUNGARUS FASCIATUS (Schneider).

History.—The first to allude to this snake was Seba who in 1735 figured it. Sixty-one years later it was again figured, and described by Russell. †

Nomenclature (*a*) *Scientific.*—The generic name was introduced by Daudin in 1803, and is a latinised rendering of the name by which it is known according to Russell to the natives in Orissa. The specific title from the latin "banded" was applied by Schneider in 1801.

(*b*) *English.*—To all Anglo-Indians the snake is known by the name of "banded Krait."

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* See my article in this Journal, Vol. XVIII, p. 711.

† Ind. Serp. 1796, Vol. I, Plate III.

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(c) *Vernacular.*—The name applied to it in Orissa—"bungarum pamah" is Telugu and means "gold snake." In Bengal it is usually called "rajsamp," a name probably suggested by the golden belts which encircle it, also "sankni." This latter appears to be connected with the word pronounced like our English "sunk" which is applied to the couch shells blown in Temples. If I am correctly informed these large shells are sometimes cut into several pieces by cross sections so as to make bracelets which are worn by Bengali women, and there is a street in Dacca where many craftsmen engaged in this occupation have congregated, and given to the street the name of "sunkaree." "Sankni" then appears to be a wearer of bracelets. Mr. E. Muir tells me about "kalna" (Bengal) it is usually called "sankni," but by the Hindus "dumukha" or two-mouthed. Also, he says, that the Santhals call it "bangphora" meaning two-mouthed, and "beeng."

In the North-West of Bengal, Fayrer* says it is called "kochlia krait." In Burma it has many names, "mywe min" (king snake), "ngan-wa" (yellow snake), "ngan-daw-ja" (banded royal snake), "nat mywe" (spirit snake), and "ngan-than kwinsyut" (or "ngan-than-gwin-zok" as Theobald has it) which means literally a cylinder with bands or rings on it.

General characters.—The banded krait when adult is a snake of respectable dimensions which attracts attention by its very distinctive, and highly ornamental, colouration. The head is broad and depressed, the snout short, and bluntly rounded. The eye is moderate in size, and blackish throughout, the pupil being usually invisible, but if looked at closely, sometimes an inconspicuous yellowish rim is seen to indicate its outline. The neck is barely apparent, the body smooth and glossy with a conspicuous ridge down the spine, and the tail short and ending abruptly in a finger-like extremity.

Colour.—The whole snake is broadly and alternately banded with canary-yellow and black. These bands involve from 5 to 7 scales in the length of the snake, completely encircle the body, and are of wonderfully even width, like a broad bracelet. The black

* Thanatophidia, p. 11.

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are usually rather broader especially in front, and number from 16 to 27 on the body, and 2 to 5 on the tail.* On the nape is a large, elongate, black patch rounded behind, and ogival in front where it reaches the frontal shield, and this does not extend on to the belly. On the top of the head there is a large yellow V, the arms of which diverge backwards and pass over the temples to the throat. Except the lips and lore which are yellow, the rest of the crown is black. The chin and throat are yellow.

Dimensions.—It grows to 6 feet, but specimens over 5 feet are exceptional. I had one of 5 feet 3 inches in Berhampore (Orissa) and Evans and I had one 5 feet 9 inches in Rangoon. Vincent Richards† records one 6 feet long, Talbot Kelly in his book on Burma (1905, p. 110) mentions one just over 6 feet, and Major Leventon, I.M.S., told me of a large gravid ♀ he saw at Sibsagar in Assam that measured 6 feet 1½ inches. Fayrer ‡ says on the authority of Mason that it grows to 8 feet, but I very much suspect there was some guess work in this estimate. I have had over 50 specimens from Bengal, Orissa, Assam, Burma and China.

Identification.—Though the colour and banding is so distinctive those who trust to these only may be deceived by the similarity in this respect shown by some specimens of the harmless snake *Lycodon fasciatus*. It is best in this instance as in every other to identify your snake by scale characters. The enlarged vertebrals, and entire subcaudals will proclaim the snake a Krait for certain, and the ridged spine, blunt tail or the yellow bands will distinguish this from all the other kraits.

Haunts.—It is usually found in open tracts of country, grass land, crops, or low sparse jungle but not, I think, so much in dense jungle. It is no infrequent visitor or inhabitant of Cantonments, and is often to be encountered in well populated localities, getting into the bazaars, native huts, and Cantonment houses. In my early Indian days the rustling of something, one night across the mat in a dak bungalow proved when a lantern had been lit to have proceeded from a large banded krait in the room which was

* In a specimen I killed in Hongkong there was a large black blotch ventrally in many of the yellow bands.

† Landmarks of snake poison, p. 5.

‡ Thanatophidia, p. 11.

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duly despatched, and I have heard of other similar experiences. About the Jail at Insein near Rangoon, it was very commonly disturbed by convicts, and I used to get one or two a week with great regularity in the rains. Instead of retiring to some place of security by day, many specimens seem to lie up in grass or shallow depressions in the ground or open drains and are often very badly concealed. Their bright yellow bands make them very conspicuous, and they are not likely to escape the notice of the village urchins at their games, or the chance wayfarer.

Many of them show a special attachment to damp places, and are to be met with in paddy fields, and even in pools of water, or river sides. I had one brought to me in Assam that was reported in the water, devouring a fish. Another in Burma took refuge in a pool of water during the day. Captain Kelsall* encountered one in a hole in a bank which escaped him by taking to the water, and diving. Theobald†, too, mentions its frequenting moist places, and the vicinity of water, and the Revd. E. Muir says the natives of Jalna tell him it is generally found in flooded rice fields in the rains. A specimen in Assam in seeking to escape was reported to have climbed 10 feet high into a tree, but I have never heard of any other clambering efforts.

Disposition.—The banded krait is a sluggard of the most confirmed type. It is lethargic to a degree that is difficult to understand, and one is very apt at first to think that a snake which is really quite unhurt, is suffering from ill-treatment and severe injuries. If encountered coiled up peacefully in the day-time, instead of taking alarm, and trying to escape the probabilities are that it will remain "in situ," and even when stepped upon, or kicked up it will frequently merely shift its position, and take no further notice. I have seen it picked up by a parcel of noisy urchins, and carried over a stick, from which it fell off every few yards to be picked up again and again without endeavouring to escape or show resentment, a treatment too humiliating for even the defenceless and blind little burrowing snake *Typhlops braminus* to submit to without some struggles, and attempts to defend itself. I have known it take refuge in a pool with a howling and excited mob,

* Jour. Asiatic Soc., Bengal 1894, p. 12. † Report, Cat. Brit. Burma, p 62.

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assailing it from all sides with stones, sods of earth, etc., and yet seen it lie inactive unless actually struck by a missile, or immersed by a wave from one when it simply re-appeared at the surface, and maintained a dignified unconcern.

I have known it again when discovered swallowing another snake, take no notice of a ring of spectators, but continue engulfing its victim. Many specimens have been brought to me alive and quite unhurt, and I have never succeeded in making one angry, never seen one bite at anything nor raise itself in menace, though provoked in a most outrageous manner. What it usually did was to sulk; sometimes it flattened itself to the ground, but more usually lay still, and hid its head beneath its body. Sometimes if an eye was still visible, and an object pushed towards it, it made a slight spasmodic movement and withdrew its head still further so as to avoid seeing the coming danger. If the tail was smartly rapped, it merely shook it, and moved its position. I have sometimes thought that this singularly apathetic behaviour which strongly suggests that of an animal that has been drugged, is merely evinced during the day-time is, perhaps, due to its being dazed by the sun, or strong light, but an incident which occurred to a friend some years ago shows that, even at night the creature is naturally slothful and stupid. My informant, Colonel Evans, came across one when riding over an open piece of ground. He could clearly see the snake in the moonlight so dismounted, and having no weapon of offence, called to his servants to bring a stick. For several minutes Colonel Evans walked round the snake, which instead of trying to escape, merely altered its direction as he confronted it. It moved in a lazy way, and offered no menace, and was eventually killed.

Its movements are in keeping with its phlegmatic disposition. I have never seen one in the least degree active, and it is doubtless due to these traits in its character that no casualties in the human subject have hitherto been reported.

I have never heard one hiss, but Colonel Evans remarked that the ♀ that was found lying up with hatching eggs did so. The same observer mentioned the intolerance shown by the young brood to the sun.

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Habits.—This krait is in the main of nocturnal habit. When encountered at night it is always on the move. In Assam the planters who owned motor-cars frequently saw it by the brilliant light of their lamps crossing the roads, and on most of the occasions when it was killed in or about habitations, it was seen at night. The specimens met with in the day-time were for the most part disturbed from some insecure quarter where they were lying inactive. It evidently, though is sometimes abroad during daylight in quest of food for the specimen reported above as eating a fish, was seen in the day. Mr. Jacob observed one which he shot in the day-time in conflict with a large tree snake, and Major Evans' record of one eating a chequered kulback was also in the day.

It is most frequently about in the rains, in fact, no less than 13 of the 17 specimens, Evans and I collected in Rangoon, were killed in June, July and August. At other times of the year, it was decidedly scarce.

Food.—From my remarks upon its disposition, one might, with reason, expect that it usually preys upon small and defenceless creatures, such as frogs and toads, but this is not so. It shows a very great partiality for an ophidian diet, and in its choice by no means picks out the weaklings, but will attack snakes as large or larger than itself, and overcome such formidable species as the dhaman (*Zamenis mucosus*) and the Himalo-Malayan rat snake (*Zamenis korros*), as I have seen myself. Mr. Jacob, too, found one in conflict with a large tree snake of a very truculent nature, *viz.*, *Dipsadomorphus cynodon*; and Colonel Evans records it having swallowed that vicious reptile the chequered keelback (*Tropidonotus piscator*). Blyth says that its usual fare is cobras, and we must, therefore, assume, that he has observed it swallowing this species. I once found a lizard of the Skink family (*Mabuia multifasciatus*) had been eaten, and once a clutch of snake's eggs, which were probably of the buff-stripped keelback (*Tropidonotus stolatus*). Three of these eggs were intact, and I could discover no injury done to them, though I examined them closely with a lens. This seems remarkable when one reflects that there are two long rows of teeth in the roof of the mouth, and many opposed to them in the lower jaws. On one occasion in Assam, one was reported to

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be swallowing a fish. In every other instance where I have found anything in the stomach a snake had been devoured, and in many other examples, where the stomach was empty, an examination of the cloacal contents made it certain that a snake had previously been victimised as the very distinctive ventral shields floated up to the surface after softening the mass in water.

The victim in every instance lay fully extended within the krait, and, even when small, was never folded or collected into a mass. Although the stomach is remarkably elongate in this, and other kraits being 9½ inches long in one which measured 4 feet and ½ an inch, it is not long enough to accommodate most of the snakes preyed upon. Often a considerable length of the victim lies in the gullet, and may even protrude for some distance beyond the mouth; in fact, inevitably must do so when the quarry is of a length nearly equal to its vanquisher, or as sometimes happens even greater. A specimen I had in Assam, probably about 5 feet long, had been pickled in the act of eating a dhaman (*Zamenis mucosus*), which from the length of its tail must have been about 5 feet long and no less than 1 foot 4¾ inches were protruding from the mouth. In another instance, a banded krait measuring 4 feet 2½ inches was killed in the act of swallowing an Indo-Malayan rat-snake (*Zamenis korros*), which measured 4 feet 2½ inches. In such cases, a considerable length of the victim must remain unswallowed until that portion already in the stomach is liquified by digestion, and this organ capable of accommodating a further instalment. It is probable that there is some protrusion beyond the jaws for a day or two, and that the whole length of a relatively large snake is not completely digested for a week.

The victim is at first seized anyhow, often being grasped in the middle of the body, but as its struggles grow feebler under the masterful grip of its captor, and the more powerful influence of its poison, it is released and siezed by the head. It would appear that sometimes the quarry is seized at first by the head, and swallowing commenced forthwith, for the most violent struggles ensue, in which the overpowered snake, although partially swallowed, has wreathed itself around its foe with a strength that refutes any idea of being enfeebled by the paralysing action of the krait's venom.

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These conflicts are very disagreeable to watch, the strenuous though futile contortions which are to be seen even to the last inch or two of the victim's tail, must arouse the sympathy of the most callous spectator.

It is rather a pleasing reflection to my mind that the tables are sometimes turned, and the banded krait has itself to suffer from the same treatment it has probably meted out to scores of its weaker relatives. Mr. Primrose has recorded an encounter in this Journal, Vol. XII, p. 589, in which a banded krait had been overcome, and swallowed by its more powerful rival the hamadryad.

The Sexes.—My notes in Assam show that the sexes are evenly balanced, for out of 11 specimens sexed, 5 were males and 6 females. There appears to be no difference in the relative lengths of the body or tail of sexual import. The anal glands in both sexes secrete a blackish material reminding one of the blackened oil caused by machinery in motion.

Breeding.—Although over 50 specimens have passed through my hands I have been singularly unfortunate in gaining any information about the breeding, never having had a gravid ♀. All that is known on the subject is contained in the most interesting record furnished by Colonel Evans which appeared in this Journal.* The ♀ which measured half an inch less than 4 feet had retired beneath the ground where some elephant tusks had been buried, and had here deposited 8 eggs which she had evidently incubated as she was still in attendance when on the 19th of May 4 of them had hatched. She was thin as the result of her self-imposed imprisonment, but though she evidently possessed strong maternal instincts, it is curious that she showed no concern when her young brood were tampered with. The average dimensions of 3 eggs was 2·3 inches in length, and 1·5 in breadth. The young measured from 11¾ to 12½ inches but as only two were taped, it is probable that these were not the extremes of length. They are reported as having more pointed tails than adults, and a modified colouring, the yellow being replaced by a dirty-white and the black by a leaden-hue. It is noteworthy, too, that they were remarkably active. Judging from the time of year when those young

* Vol. XVI, p. 519.

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appeared it is probable that the mating season is in January or February. A young specimen of 1 foot 2 inches was sent to me last year by Mr. Frere from Tharrawady (Lower Burma) killed in June.

Growth.—It appears from my notes that the young grow about a foot during each of the first three years of life and the female reported above would therefore be completing her third year.

Poison.—Though this snake is a poisonous one, and common in many districts there is no authentic case of toxæmia in the human subject arising from its bite,* and it even seems doubtful if it would prove fatal to man. Rogers by direct experiment on birds fixed the lethal dose as 14 times that of cobra poison. Lamb, however, estimated that it is but 7 times that of cobra poison. In any case since we know that an adult cobra sometimes bites a man severely without injecting a lethal dose of poison, it would seem improbable that a lethal dose would be delivered in the bite of a snake of very similar proportions whose poison is 14 times or even 7 times less virulent. This conclusion seems to receive confirmation by the Burmese who are a very observant race, and knowledgable in Natural History matters. Most of them affirm that the banded krait is not poisonous. If it were otherwise, I think the Burmese of all people would be aware of it, for the snake is very common in their Province. Although it is not an evily-disposed snake it is difficult to believe that it is never the cause of a casualty, and if it ever occasioned loss of life or even serious symptoms, it is not likely to have escaped an evil reputation. Mr. Muir tells me that the natives about Kalna too are very doubtful

* Fayrer records the case of a woman at Tavoy (Thanatophidia, p. 45) who was bitten on the dorsum of the foot by a snake identified as the banded krait by Dr. Paul. The accident happened at 8 p.m. and beyond some local tingling and swelling at the time no ill-effects were noticed, and she was discharged from the hospital next day as recovered. We may assume that if any poison gained access to the wound, the dose was insignificant as no toxic symptoms were noted. The case quoted as such by Calmette (Venoms, Venomous animals, etc., p. 336) is obviously a fallacious record as this snake does not occur in Central India, the locality where the casualty occurred! The fact, too, that the original reporter says that the snake which was 28 inches long was full grown, and talks of a single mark made by an *incisor* tooth, proclaims a lamentable ignorance on his part of the snakes of India, and snakes in general, since no snake has incisor teeth.

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as to its poison as it seems very seldom to bite. Mr. C. Gore told me of a bullock he once saw struck at and injured by this snake which succumbed 20 minutes later.

Poison apparatus.—The fangs are like those of other poisonous Colubrines, being much stouter, and shorter than those of a viper of similar length. There are usually two operative fangs placed side by side in each maxilla. The poison glands are relatively smaller than those of the cobra. I know of no special remarks made upon the physical properties of the poison.

Toxic symptoms.—To my namesake A. J. Wall we owe most of our knowledge of the poisonous properties of banded krait venom, indeed since his day further investigations have done little more than confirm his work. As no human records are available, the only picture we can present of the clinical manifestations of the toxæmia is as a result of experiment in the lower animals.

Wall says the local condition produced is the same as that seen in cobra bite. The part becomes swollen and painful, and later discoloured blood or bloody serum oozes from the punctures for some hours, and inflammation sets in later. He says the discolouration is much less than that seen in cobra bite, but if the tissues are cut into the same pinkish effusion of serum is to be observed in the areolar tissue. Lamb says the local reaction is much less than that seen in cobra bite; in fact little or nothing is to be observed at the side of the bite. Constitutionally two very distinct types of disturbance occur, both equally fatal, but each differing in the manner in which death is brought about, and the time that elapses before the fatal issue.

In the first the symptoms are exactly those of cobra poisoning being due to a principle in the venom (neurotoxin) that acts upon the brain and cord. Within an hour or two, or perhaps longer, the bitten subject is prompted to assume a sitting or even a lying posture from a feeling of weakness. This is the beginning of a paralysis that creeps on, affecting first the legs, then the trunk, and last the head, and as time advances the weakness, and loss of control of certain muscles becomes more and more pronounced. Breathing becomes increasingly difficult and hurried, the face

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growing livid in proportion to the embarrassment of this vital function. The head droops, the lower lip falls away from the teeth, so that the saliva, which cannot be swallowed owing to paralysis of the throat, dribbles from the mouth. Movements of the tongue become impaired so that speech is rendered difficult, and the eyelids droop. Finally, death is brought about by asphyxia owing to the complete paralysis of the respiratory centre, and the final issue is frequently ushered in by convulsions. Consciousness is retained till the end. The heart is also affected in this form of snake poisoning owing to a synchronous paralysis of the vaso-motor centre, hence fainting with a feeble pulse may occur, directly attributable to the poisoning process quite apart from fright, or pain. In this last respect this poison differs in its effects from those of the common krait, and the cobra in both of which there is an element that by stimulating the heart muscle, and contracting the arterioles, counteracts the effects on the vaso-motor centre. Death may not occur till the 2nd or 3rd day from this type of toxæmia.

In the second type of disturbance symptoms are not evoked till the 5th day or later, and are then the result of a chemical destruction of cells in the central nervous system (due to neurolysin). Though the toxic element responsible for this form of disturbance is met with in common krait and cobra venoms, it only occurs in quantities insufficient to make its presence evident, but in banded krait venom, and in this only of the snakes whose poison has been investigated, serious symptoms are evoked by its presence. There are serious depression of spirits, loss of appetite, high fever, and very rapid and extreme emaciation. The kidneys become diseased, so that the urine contains albumen, and diminishes in quantity. Discharges from the eyes and nose and other mucous surfaces accompany the above, and death occurs in a few days from exhaustion.

Treatment.—In considering the treatment of a bite from this snake it is best to begin by recalling the various methods which have been tested experimentally in animals, and found futile, as well as other orthodox measures. Both Lamb and Rogers have tested the efficacy of Calmette's antivenene, and proved it useless, thereby falsifying Calmette's claims in this direction.

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Drugs, such as Ammonia, Strychnia, and Alcohol, are not likely to do any good, but on the contrary harm. They all act on the central nervous system, and to administer them is like adding oil to flame, as they can only accentuate the paralysing effects of the snake venom. In addition Calmette has shown that Alcohol by neutralising any antitoxin that the subject may be forming in his own person, in response to the toxic absorption, acts in opposition to nature's attempts to subdue the toxic process.

It is extremely dubious if ligature, the orthodox measure recommended in every text book, is of the slightest avail, in this or any other snake poisoning process.*

Finally, artificial respiration is quite useless in this form of ophitoxæmia as shown by Lamb and Rogers as the heart shares in the general embarrassment, and tends to fail unlike what occurs in cobra and *cæruleus* poisoning.

The only method, which appears to afford a rational means of success, is the application of permanganate of potash locally. This salt is known to completely destroy the toxicity of all snake venoms. In practice, however, its merits have not met with the success one would expect. It must be remembered that the poison on absorption becomes intimately connected with the tissues at the bitten part, and whether this locking-up is merely a mechanical or a chemical process, it is extremely difficult to dissociate the venom from the tissues so as to allow the permanganate to come into antagonistic relationship with, and destroy it. The success of the treatment, therefore, must depend upon the degree to which the tissues are cut into, and the extent of surface opened up, into which permanganate can be introduced.

The surgeon should excise the bitten parts freely and dissect up all tissues, that show where poison has been absorbed, and then introduce permanganate crystals, and moisten them with water. If the non-professional man uses the knife at all he should cut a series of parallel incisions (as he would operate on a ham) close together, deeply and freely in the *length* of the limb, or member, and then introduce permanganate. As free use of the knife to a

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* *See* Trans. Bombay Medl. Congress 1909, p. 249.

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degree that is really necessary seems to me a dangerous proceeding for the layman to adopt, a better plan is to destroy the bitten part freely with red hot iron, or nitric acid and subsequently to apply permanganate.

Fables.—Mr. E. Muir tells me that about Kalna it is said to have two mouths, one at the caudal extremity, and is reputed to be able to move forwards or backwards. Also that it is said to make a noise like the bellowing of a cow, which reminds me of the traveller Chateaubriand's description of a S. American snake he had met which when approached became flat, appeared of different colours, hissed like a mountain eagle and bellowed like a bull!

Uses.—The same informant says that the bones are sometimes made into necklaces, and worn by Hindus.

Parasites.—Entozoa of several kinds infest this snake. I have found two distinct nematode worms in the stomach which were identified by Professor Von Linstow* as *Kalicephalus willeyi*†, and larval and immature forms of an *Ascaris*. One of these, I forget which, anchors itself to the coats of the stomach and is found attached there after death, but the other is free, and though I believe inhabits this organ exclusively in life is often found to have wandered into the intestine after death, or into the gullet, and mouth. The *Pterocercus* or larval form of a tape worm, which Von Linstow suggests may be harboured in its adult form by birds of prey that devour snakes, is a very frequent parasite in the intestine. A fourth parasite is the linguatulid *Porocephalus crotali*‡, a maggot-like, whitish animal half to three-quarters of an inch long, which attaches itself by four hooks to the mesenteric tissues, and does not enter organs.

Distribution.—The Mahanadi Basin, Eastern half of the Ganges System, Brahmaputra, and Irrawadi-Salween Basins, through Indo-China to South China in the East, and through the Malayan Peninsula to the Archipelago as far East as Java. Within our Indian Dominions it is a common snake in Burma, Assam and

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* Record, Ind. Mus., Vol. II, Part 1, p. 109.

† Spol. Zeylan, Vol. I, p. 99.

‡ Bombay N. H. Journal, Vol. XIX, p. 837.

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Eastern Bengal, less common in Bengal and Orissa, and not rare, I believe, in the Central Provinces.*

A specimen of Colonel Beddome's collecting said to be from the Anamallays is now in the British Museum, but I do not credit the locality, and have shown good cause to doubt the accuracy of this record.† It is an inhabitant of the Plains, and rarely ascends to any Hills, and then probably not above 3,000 feet. Thus in the Eastern Himalayas in 1908, out of 778 snakes collected between 500 and 7,500 feet, no specimen came to hand. In 1909 Mr. Wright of Tindharia sent me a single specimen collected somewhere between 500 and 2,800 feet, but he had forgotten the exact locality. In the Khasi Hills, Assam, out of 264 snakes collected in Shillong (4,900 feet) I got no banded krait, but saw a dead one on the road somewhere near Nongpho (1,900 feet) which I guessed might have been about 3,000 feet elevation. Mr. Hampton writing from Mogok, Ruby Mines (3,800 feet), though an industrious collector of snakes for many years, had, he told me, never seen this snake there.

Lepidosis—Rostral.—Touches 6 shields, the rostronasal sutures longer than the rostro-internasal, and the latter about twice the length of the rostro-labial. *Internasals*—Two, the suture between them equal to or rather less than that between the præfrontal fellows, and about two-thirds the internaso-præfrontal. *Præfrontals*—Two, the suture between them rather greater than the prœfronto-frontal: in contact with internasal, postnasal, præocu-

* A member of our Society addressed the Secretary about February last year asking if he could name a snake which he had killed in Chanda, and he described as being completely banded with broad belts of yellow and black, and with a finger-like tail. I mislaid the letter which was handed to me, and cannot quote the writer's name. Mr. E. H. Young wrote to me last year, and told me he had killed a banded krait in the Sal forest, 40 miles North of Bilaspur. Two Officers told me of a banded krait killed at Raipur some years ago. When on Famine duty in 1897, a friend told me of a yellow and black banded snake he had killed in his verandah the night before near Bilaspur, which I had no doubt at the time was a banded krait. Colonel Bannerman tells me he has known it from Raipur and Sambalpur.

† Terr. snakes, Brit. Ind. Dom. 1908, p. 17.

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lar, supraocular, and frontal. *Frontal*—Touches 6 shields, the fronto-supraocular sutures rather longer than the rest. *Supraoculars*—About half the breadth, and three-fourths the length of the frontal. *Nasals*—Quite divided by a nostril that is nearly as deep as these shields; in contact with the 1st and 2nd only of the supralabial series. *Loreal*—Absent. *Præoculars*—One. *Postoculars*—Two. *Temporals*—One. *Supralabials*—7 with the 3rd and 4th touching the eye. *Infralabials*—4, the 4th much the largest and in contact with 2 scales behind; the 4th (or 3rd and 4th) touching the posterior sublinguals. *Sublinguals*—Two subequal pairs. *Costals*—Two headlengths behind head 15, midbody 15, two headlengths before the vent 15. Smooth with no apical facets. *Vertebrals*—Enlarged, broader than long, hexagonal. *Supracaudals*—In odd rows with enlarged vertebrals. *Ventrals*—200 to 234,* rounded. *Anal*—Entire. *Subcaudals*—23 to 39, entire.

Anomalies.—I have once seen the upper postocular confluent with the supraocular, and once two temporals on one side.

Dentition.†—The maxilla has a pair of tubular fangs placed side by side, behind which are 3 teeth grooved on their outer faces, about one-third the size of fangs.‡ *Palatine*—11 to 13, subequal, about as large as the postmaxillary, and grooved on their inner faces. *Pterygoid*—10 to 12, the anterior as large as the palatine, the posterior slightly diminishing, grooved on their inner faces. *Mandibular*—16 to 17, abruptly decreasing in front, and more gradually behind, the median about as large as the palatine; grooved on their outer faces.

Our coloured plate is good but does not do justice to the glossiness of the scales in life. Plate A is taken from a photograph of a specimen in Parel that came from Raipur, C. P. We are indebted to Sub-Assistant Surgeon C. R. Avari for the photograph which is a good one.

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* In my Rangoon specimens 208 to 221, in Assamese 221 to 231.

† From 4 skulls in my collection.

‡ Similar except in the number of the postmaxillary teeth, to those of *caeruleus* (*See* this Journal, Vol. XVIII, figures C and D of Diagram).

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The genus *Lycodon* is one of many into which the Aglyphous series of the family *Colubridæ* is divided. This series is characterised by an absence of either grooved, or tubular fangs, in the maxillæ, and all the representatives are, therefore, non-poisonous.

When treated by Mr. Boulenger in 1893 * it included 15 species. Since this time he has described another, *viz.*, *butleri* from Perak in this Journal†, and I have described two, *viz.*, *mackinnoni* from the Western Himalayas ‡, and *flavomaculatus* from the Deccan.§ Of the 18 species now grouped together under this title, 11 occur within our Indian Dominions.

As shown by Stejneger,¶ the title *Lycodon* is a misapplication to this genus, for the type of *Lycodon* is the S. American snake, now wrongly known as *Lycognathus cervenus* (*i.e.*, the *Coluber andax* of Daudin).

Lycodon then being clearly preoccupied should give place to Wagler's name *Ophites* of which the Malayan *subcinctus* is the type.

In spite of this I adhere to the name with which we have all grown familiar. This is an instance where in order to avoid confusion, custom, whether right or wrong, should be allowed to overrule the ethics of nomenclature. If American systematists, however, adopt the title *Lycodon* to designate their present *Lycognathus*, we have no alternative but to change our generic name to *Ophites*.

LYCODON FASCIATUS (ANDERSON).

Anderson's Wolf-snake.

History.—The species was discovered by J. Anderson during his expedition to Western Yunnan, and was subsequently in 1879 described, and figured by him.**

Nomenclature (*a*) *Scientific.*—The generic name from the Greek "lukos" a wolf and "odous" tooth was given by Ferrusac†† in 1826, on account of the teeth in the maxillæ, and mandible which

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* Catalogue, Vol. 1, p. 348.

† Vol. XIII, p. 336.

‡ Vol. XVII, p. 29.

§ Vol. XVII, p. 612.

¶ Herp of Japan, 1907, p. 356.

** An. Zool. Res. Yunnan, p. 827, and fig. 4, Plate LXXVIII.

†† Bull. de Science Nat., p. 238.

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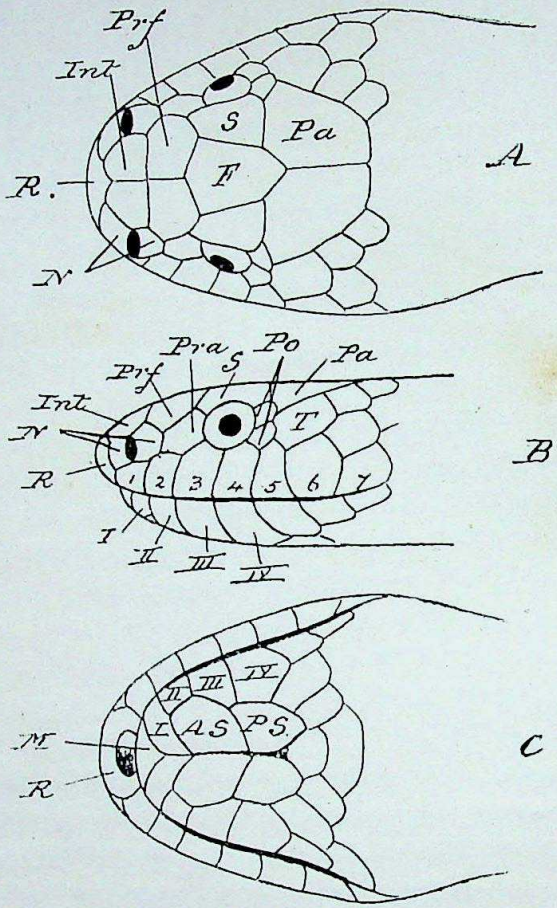

Bungarus fasciatus (× 1½).

SHIELDING OF FIGURES A, B & C OF DIAGRAM.

A. S.	Anterior Sublinguals.
F.	Frontal.
Int.	Internasals.
M.	Mental.
N.	Nasals.
Pa.	Parietal.
Po.	Postoculars.
Pra.	Præocular.
Prf.	Præfrontal.
P. S.	Posterior Sublinguals.
R.	Rostral.
S.	Supraoculars.
T.	Temporal.
1 to 7.	Supralabials.
I to IV.	Infralabials.

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from their superior length, and position resemble the canine teeth of dogs and wolves. "*Fasciatus*" is from the Latin meaning banded.

(*b*) *English.*—I think the best name for it is Anderson's Wolf-snake, a literal reference to its specific name being equally appropriate, to many of the species.

(*c*) *Vernacular.*—Mr. Hampton tells me that about the Ruby Mines in Upper Burma it is called Ngan-do-ja. This is the same as one of the Burmese names for the banded krait, and implies "banded royal snake."

General characters.—It is a snake of moderate dimensions, and rather slender proportions, very strikingly and handsomely marked, and on this account likely to attract attention. The head is markedly flattened, and the snout broadly rounded. There is no ridge from the eyebrows forwards. The nostril occupies the whole depth of the suture dividing the nasal shields, but is nevertheless moderate in size, as the suture occurs at the lowest depth of these shields. The eye is rather small, and the iris, unlike all the other species of the genus that I have seen, is heavily flecked with grey so that the vertical shape of the pupil is very apparent. The neck is fairly evident, the body long, round in section, and with glossy scales, and the tail is long, being about one-fourth the total length of the snake. The belly is somewhat abruptly turned up on either side of the ventral shields, *i.e.*, angulate.

Colour and markings.—The head is quite black above, and the edge of the upper lip, the lower lips, and chin are yellow, more or less mottled with black. The body and tail are alternately banded black, and yellow or dove colour with very jagged outlines. The black bands completely encircle the snake anteriorly and posteriorly, but may be more or less incomplete ventrally in the middle of the body. They are broader anteriorly than posteriorly, and number 23 to 33 on the body and 14 to 18 on the tail in my Burmese specimens, 32 to 38 on the body and 15 to 20 in Shillong specimens, the anterior involving 9 to 10 scales vertebrally in the length of the snake. The intermediate bands are yellow, wheat, or dove-coloured, and often more or less subdivided by narrow or broad black crossbars. Such a specimen probably accounts for Ander-

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son's description of the type which had 55 bands, or twice the number as counted in my specimens.

The snake should never be confused with the banded krait, even when attention is only paid to colour, but evidently some Burmese confuse the two as already mentioned. Again, Mr. Hampton himself sent me several specimens as kraits, probably being misled by his Burmans. It is for this reason that the two snakes are shown together on our Plate, and discussed together in this article.

Identification.—The dual combination which follows will suffice to distinguish it from all other Indian Snakes up to the present time known, *viz.*, (1) scales two-headslengths, behind the head 17, in midbody 17, and two-headslengths before the vent 15. (2) Loreal touching the eye (*see* fig. D of diagram).

Dimensions.—Specimens over 2½ feet are unusual, but I have had 7 such, the largest being a ♀ 3 feet and ¾ of an inch in which the tail was slightly imperfect, and a ♂ 3 feet and ¼ of an inch, both captured in Shillong. One 3 feet long I got from Burma. I have seen in all 31 specimens. Mr. Hampton tells me the largest he has seen was 3 feet 7 inches in length.

Haunts.—It appears to frequent jungle tracts in hilly situations for choice. Shillong where I got so many is heavily wooded, and it was common inside the station, and more than one was encountered inside a bungalow. Mr. Hampton tells me that they do well in captivity and will live for years. When they died they appeared to be in excellent condition but, perhaps, too fat.

Habits.—From Mr. Hampton I learn that it is essentially a nocturnal snake, never appearing during day light, but he has often noticed them in captivity visible, at 5 and 6 a. m. When people began to move about the house they retired under their blankets unless they were in their bath where they remained in the water until mid-day. He tells me further that they are very quiet, but very quick, striking right, left, or centre without the slightest warning.

The few specimens I have seen alive were active, and plucky resenting interference, and showing it by assuming an offensive attitude.

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Distribution of *LYCODON FASCIATUS.*

1 Tezpur (I.M.). 2 Shillong, Khasi Hills, 4,900 feet (I.M. and F.W.). 3 Haka Chin Hills, 6,500 feet (Wall and Evans.) and (F.W.). 4 Mansi, Katha, Upper Burma (Bom. M.). 5 Ponsee (Anderson). 6 Mogok, Ruby Mines, 3,800 feet (B.M., F.W.). 7 Maymyo (Evans). 8 Taounggyi, Shan States (B.M., Wall and Evans).

B.M. implies British Museum, I.M. Indian Museum, Bom. M, our Society's Museum, F.W. the author.

Distribution of *B. FASCIATUS.*

1 Aska (I. M.) and Berhampore (F. W.). 2 Chanda (Record received by letter to Secretary of our Society). 3 Raipur (Information from two Sources received by me). 4 Near Bilaspur (F. W. and E. J. Young). 5 Calcutta (I.M.). 6 Raniganj (I. M.). 7 Bettiah (F. W.). 8 Below Tindharia (F. W.). 9 Jalpaiguri (Information from Mr. W. A. Jacob). 10 Dacca (I. M.) and Silchar (Primrose in this Journal, Vol. XII, p. 589) 11 Near Nongpho, Circa, 3,000 ft., Khasi Hills (F.W.). 12 Samaguting Circa, 2,000 ft., Naga Hills (I.M.). 13 Sibsagar (I. M.). 14 Dibrugarh Tinsukia, Doom Dooma (F. W.). 15 Near base of Daffla Hills, N. Lakhimpur, (F W.) ; 16 Ruby Mines (B. M.). 17. Mandalay, Sagaing (I. M.). 18. Pyawbwe and Meiktila (Wall and Evans). 19 Toungoo (B. M.). 20 Tharrawaddy (F. W.). 21 Rangoon (Wall and Evans). 22 Moulmein (F.W.)

I. M. implies Indian Museum, B. M. British Museum, and F. W. the author. The dotted lines in the map imply that the exact limits of its distribution are here uncertain.

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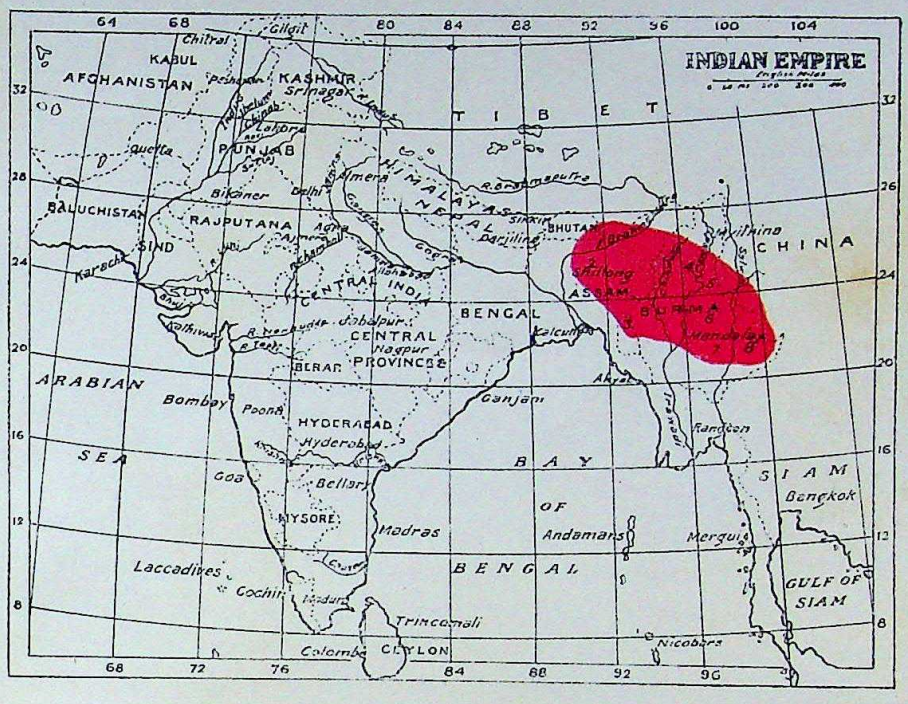
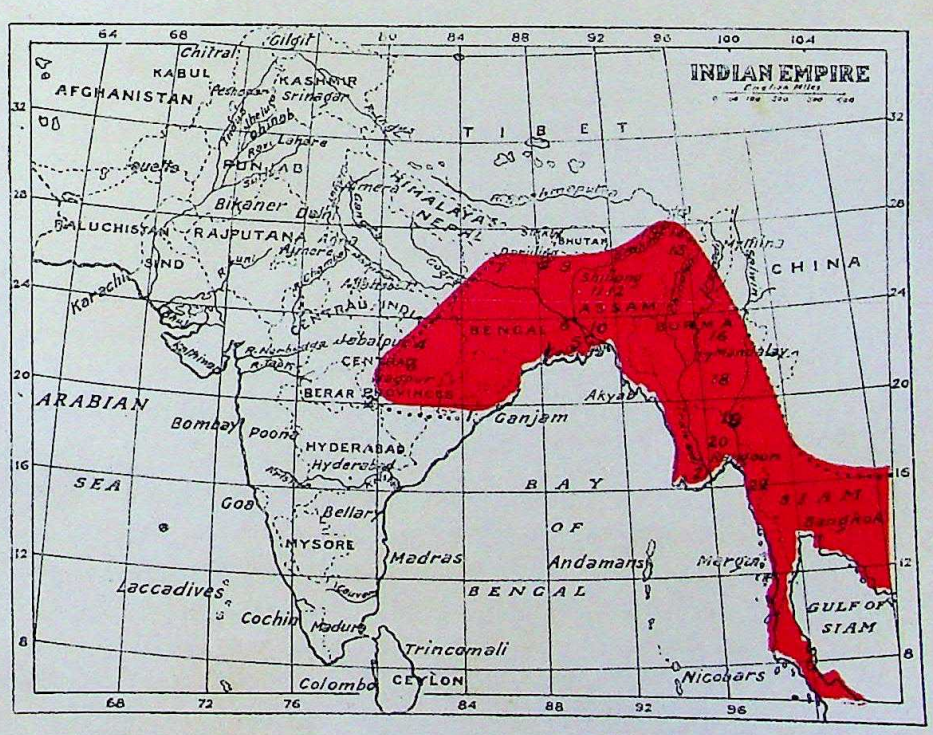


Distribution of *Lycodon fasciatus*.



Distribution of *Bungarus fasciatus*.

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I found the slough of one in a pine wood adhering some 5 feet nigh to the trunk of a tree that was fully 18 inches in diameter. This shows that it can climb deftly like its near relative *aulicus*, for the irregularities in the bark were very slight, and there were no branches to aid it.

Food.—I have found the skink *Lygosoma indica* in the stomach once, and on another occasion a skink of similar dimensions and probably of the same species. Mr. Hampton says his specimens in captivity readily devoured lizards of the same species, and also the Burmese slow worm *Ophisaurus gracilis*, but took no notice of young rats or sparrows. Further, they evinced serpentivorous tastes, being specially fond of the blind snake *Typhiops diardi*, but if nothing else was handy the big ones practised cannibalism, eating younger specimens of their own species. Another snake which they devoured eagerly was *Coluber porphyraceus*.* On one occasion he saw one in captivity endeavouring to swallow a green pit viper *Lachesis gramineus* not quite so long but far more bulky than itself. It had swallowed half of it, but had to give up the attempt, the victim which was dead proving too large. There were plenty of lizards in the cage when this happened. It wreathes its body round its victim I am told.

Fœs.—Mr. Hampton says one of his was eaten by a cobra (*Naia tripudians*). Recently I had one sent to me which had been removed from the stomach of a hamadryad (*Naia bungarus*) by Mr. Venning in Haka (Chin Hills, Upper Burma).

Sexes.—Males and females appear to be equally abundant. Out of 13 sexed in Shillong, 6 were ♂♂, and 7 ♀♀. I can discover no differences of sexual import. The relative lengths of the body and tail seems to be the same in both, and so are the numbers of ventral and subcaudal shields. The secretion from the anal glands is yellowish and custard-like, and as abundant in a young specimen (a hatchling), as in mature examples.

Breeding.—The species is oviparous, for Mr. Hampton has had eggs laid on two occasions, once 10 and once 14. Unfortunately the dates of deposition were not noted. A small example which I

*As Mr. Hampton was uncertain of the identity of the snakes herein referred to he sent me specimens.

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am nearly sure was a hatchling and which measured 8½ inches was found in a child's nursery on the 19th of September in Shillong, and seems to indicate that the breeding season in these Hills is considerably later than in the snakes of the adjoining Plains. I have had two other specimens of similar length—8⅛ and 8¼ inches—from Burma, the dates unknown.

Growth.—The young appear to grow about 6 to 8 inches during the first 4 years of life, when they are about 3 feet in length.

Distribution.—It inhabits Hilly Districts between the Brahmaputra and Salween River Systems, but has once been reported from Tezpur, Assam.* I presume this is the Tezpur on the North bank of the Brahmaputra, but since it was taken by Godwin Austen on the Duffla Hills Expedition it appears to me possible there may be another Tezpur in those Hills, especially as the snake with this exception has always been collected in Hills. It is common in the Khasi Hills about Shillong at an altitude of 4,500 to 5,500 feet, also in the North Shan Hills about the Ruby Mines (Mogok 3,800 feet), and may prove to be equally common in intervening Hills when those have been thoroughly exploited.

Lepidosis—Rostral.—Touches 6 shields, the rostronasal rather greater than the rostro-internasal sutures. *Internasals*—Two, the suture between them about ½ to ⅔ that between the præfrontal fellows, and ½ to ⅔ the internaso-præfrontals. *Præfrontals*—Two, the suture between them rather greater than the præfronto-frontal: in contact with internasal, postnasal, loreal, præocular, supraocular and frontal. *Frontal* touches 6 shields, the fronto-supraocular subequal to or rather smaller than the rest. *Supraocular*—Length about ⅔, and breadth along a line connecting the centres of the eyes, less than ½ the frontal. *Nasals*—Divided, in contact with the 1st and 2nd labials. *Loreal*—One, elongate, not touching internasal, touching eye beneath the præocular. *Præocular*—One. *Postoculars*—Two. *Temporals*—Two, the lower touching the 6th and 7th labials. *Supralabials*—8, the 3rd, 4th and 5th touching the eye. *Infralabials*—6, the 6th largest, and touching 3 scales behind, the 5th and 6th touching the posterior sublinguals. *Sublinguals*—Two pairs, the

* Lately reported from Kerseong in the Eastern Himalayas (Journ. Bomb. N. H. S. Vol. XX, p. 857.)

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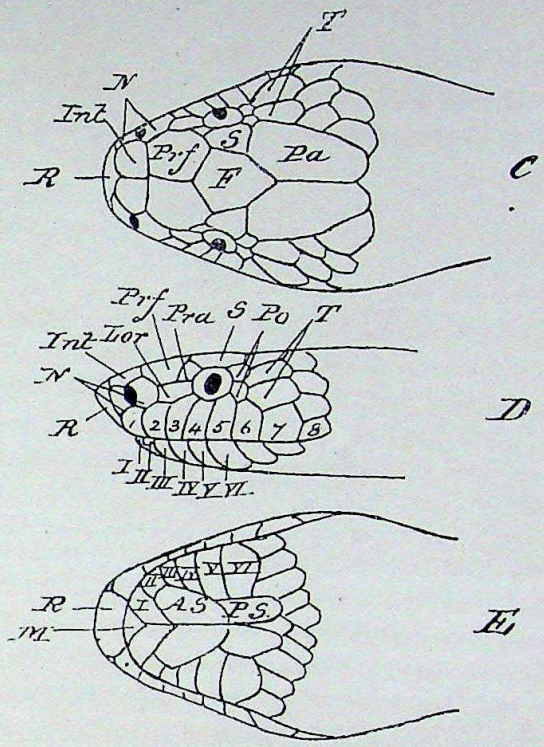
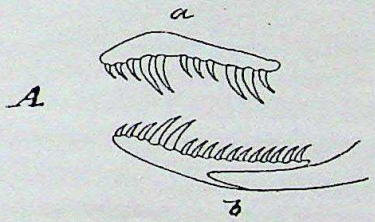
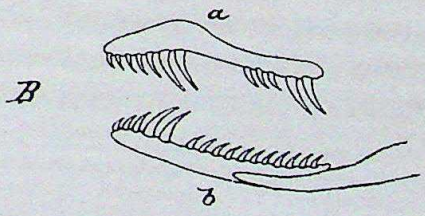


Lycodon fasciatus (× 2).





A. Maxilla (*a*) and
Mandible (*b*) of *Dinodon rufozonatus*.
B. Maxilla (*a*) and
Mandible (*b*) of *Lycodon fasciatus*.

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posterior rather smaller. *Costals*—Two-headslengths behind the head 17, midbody 17, two-headslengths before vent 15. In the step from 17 to 15 the 4th row above the ventrals disappears, being usually absorbed into the 3rd, sometimes into the 5th. Keels present but rather indistinct, in all rows but the last one or two posteriorly. Apical pits present, in pairs, but often obscure. *Ventrals*—200 to 213, angulate laterally. *Anal*—Entire. *Subcaudals*—74 to 88 (90 Boulenger), divided.

Dentition†—*Maxillary.*—From 3 to 5 progressively increasing teeth followed without a gap by 2 enlarged and subequal which are about twice the length of the last preceding. A gap that would take about 3 small teeth, then 2 (rarely 3), small subequal teeth, followed by 2 large and subequal which are about twice as long as the last preceding. ‡ *Palatine*—13 to 15 subequal, and about the size of the smallest maxillary. *Pterygoid*—19 to 29, small, subequal to smallest maxillary. *Mandibular*—3 or 4, small, progressively increasing teeth followed by two large and subequal, about twice the size of the last preceding. A short gap that would take one small tooth, then from 10 to 12 small subequal teeth.

Anomalies.—I have seen the præfrontal touching the eye below the præocular once, 9 supralabials with the 4th, 5th, and 6th touching the eye once, and the præocular touching the frontal once.

Our coloured Plate might be better. The yellow is too bright, but I have seen examples nearly as bright. The iris is shown much too bright.

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† From 4 skulls in my collection.

‡ The distinction made by Mr. Boulenger between the genera *Lycodon* and *Dinodon* (Catalogues Vol. I pp. 348 and 360) is not tenable. I find that in my skulls of *Dinodon rufozonatus*, *D. septentrionalis* and *D. semicarinatus*, there is no greater gap just before the last enlarged teeth than there is in any of the 5 species of *Lycodon* of which I have skulls. The figure of the dentition of *Dinodon rufozonatus* on page 360 is not correct. On examining my two skulls it is obvious that a tooth has dropped out where the gap is shown in Mr. Boulenger's figure, and has so escaped his notice. I think, however, that the two genera deserve recognition as such on other grounds, for I find in my three species of *Dinodon* there is a smaller tooth behind the last two enlarged ones, and this is represented in Mr. Boulenger's figure. This small third tooth is not present in any of my *Lycodon* skulls, viz., *aulicus*, *striatus*, *fasciatus*, *travancoricus*, *jara*, and *flavovmaculatus*.

To be continued.

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ON THE BIRDS OF KOHAT AND THE KURRAM VALLEY. NORTHERN INDIA.

BY

LIEUT. C. H. T. WHITEHEAD, Indian Army.

With an Introduction by MAJOR H. A. F. MAGRATH, Indian Army.

PART III*

(*Continued from page* 799 *of this Volume.*)

[946.] GECINUS SQUAMATUS. The Western Himalayan Scaly-bellied Green Woodpecker.

Fulton, J. B. N. H S. xvi. p. 57 (common in Chitral from 4,000 to 8,000 ft.); Rattray, t. c. p. 659 (common in the Murree Hills); Ward, op. cit. xvii. p. 724 (widely distributed in Kashmir).

565. ♀ ad. Kohat, 1,760 ft., 6th February.

659. ♀ ad. Hangu, 2,500 ft., 8th March.

713. ♂ ad. Kohat, 1,850 ft., 20th March.

A cold-weather visitor to the District from August to the end of March; fairly common in the Miranzai Valley, but scarce near Kohat. A resident on the Samana. Occurs sparingly in the Kurram Valley up to 9,000 feet. I have several times seen this Woodpecker climbing up a cliff as if it were a tree.

[961.] DENDROCOPUS HIMALAYENSIS. The Western Himalayan Pied Woodpecker.

Fulton, J. B. N. H. S. xvi. p. 57 (Chitral: common from 5,000 to 11,000 ft.); Rattray, t. c. p. 660 (Murree Hills: abundant); Ward, op. cit. xvii. p. 724 (common).

Common on the Samana from 4,500 feet upwards, and on the Safed Koh up to tree-limit.

[963.] DENDROCOPUS SINDIANUS. The Sind Pied Woodpecker.

Rattray, J. B. N. H. S. xii. p. 341 (Thall: not rare); Marshall, op. cit. xv. p. 351 (Quetta: common near Khojak).

655, 656. ♂ ♀ ad. Hangu, 2,500 ft., 8th March.

A fairly common resident throughout the District up to 3,000 feet. Nesting commences early in April, a mulberry-tree being usually selected for the excavation. I have often observed this species in scrub-jungle some distance from trees.

* The arrangement and nomenclature followed are those of Oates and Blanford's "Birds" in the Fauna of British India. The numbers in square brackets before each name are the same as in that work.

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In this and the last species the colouring of the lower parts varies from white to a rich reddish buff, the white parts of the upper surface being also frequently tinged with fulvous. No. 656 represents this ruddy variety.

[969.] DENDROCOPUS AURICEPS. The Brown-fronted Pied Woodpecker.

Fulton, J. B. N. H. S. xvi. p. 57 (fairly common in Chitral from 4,000 to 10,000 ft.); Rattray, t. c. p. 660 (breeds in the Murree Hills up to 7,500 ft.); Ward, op. cit. xvii. p. 725 (rare in Kashmir).

580. ♀. Kohat, 1,760 ft., 13th February.

654. ♀. Hangu, 2,500 ft., 8th March.

716. ♂ ad. Kohat, 1,760 ft., 20th March.

A common winter visitor to the District, including the Samana, from October till April (last seen on the 9th).

[972. LIOPICUS MAHRATTENSIS (Lath.) is fairly common both at Rawal Pindi and Peshawar (an example from the latter place is in the British Museum), but has not been observed in Kohat as yet.]

[1003.] IYNX TORQUILLA. The Wryneck.

Marshall, J. B. N. H. S. xv. p. 351 (Quetta: occurs regularly in April); Fulton, op. cit. xvi. p. 57 (Chitral: one obtained in May); Ward, op. cit. xvii. p. 725 (nests fairly commonly in Kashmir).

80. ♂ ad. Kohat, 1,760 ft., 11th January.

69. ♀ ad. " " 18th April.

Not common. The only other examples seen were one on the 23rd of April near Peiwar, 7,000 feet (Kurram Valley), another on the 29th near Kohat, and one more in February 1909 at Kohat.

[986. BRACHYPTERNUS AURANTIUS (Linn.).—Major Magrath observed one individual at Bannu in October 1908. It is common at Jhelum.]

[1022.] CORACIAS INDICA. The Indian Roller.

Ward, J. B. N. H. S. xvii. p. 724 (rare; occurs in the outer ranges).

Resident, but partially migratory, being very common in summer and comparatively scarce in winter.

[1024.] CORACIAS GORRULA; The European Roller.

Rattray, J. B. N. H. S. xii. p. 341 (Thall: common in summer); Marshall, op. cit. xv. p. 351 (Quetta: common in May and early June); Fulton, op. cit. xvi. p. 57 (passing through Chitral early in May); Cumming, t. c. p. 689 (passing through Seistan in April); Ward, op. cit. xvii. p. 725 (summer visitor from May till November).

A fairly common summer visitor to the District and the Kurram Valley, up to 3,000 feet, from early in May till September, being particularly common round Thall, where it nests in colonies in the conglomerate cliffs.

[1026.] MEROPS VIRIDIS. The Common Indian Bee-eater.

Rattray, J. B. N. H. S. xii. p. 342 (not common at Thall); Ward. op. cit. xvii. p. 725.

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756. ♂ ad. Kohat, 1,760 ft., 28th March.

Abundant in summer, the majority arriving about the 20th of March and leaving in the middle of October. In a mild year odd birds and even parties of five or six are seen at intervals throughout the winter.

[1027.] MEROPS PHILIPPINUS. The Blue-tailed Bee-eater.

Rattray, J. B. N. H. S. xii. p. 342 (Thall: June.)

We have not met with the Bee-eater in Kohat. Colonel Rattray, however, observed a pair at Thall in June.

Major Magrath has found it not uncommon in Bannu in early autumn and has procured an example. It is very common round Rawal Pindi.

[1028.] MEROPS PERSICUS. The Blue-cheeked Bee-eater.

Major Magrath saw what he took to be this species in large numbers between Basal and the Indus, just outside our limits, in July 1907, and also observed one at Khushalgarh just inside. Another which he obtained in Bannu, where the bird is fairly common in summer, is now in the National Collection.

[1029.] MEROPS APIASTER. The European Bee-eater.

Marshall, J. B. N. H. S. xv. p. 351 (Quetta: common summer visitor); Fulton, op. cit. xvi. p. 57 (a few breed in Chitral); Betham, t. c. p. 749 (nests freely round Quetta); Ward, op. cit. xvii. p. 725 (abundant in summer).

Passes through Kohat in April and the beginning of May, returning in August and September. Possibly a few pairs nest round Thall; several were certainly there up to the time that I left (May 20th), and Capt. Keen informs me that he saw some there in July. This species breeds freely in the Kurram Valley from 3,000 to 7,000 feet. Towards the end of July, when nesting-operations were over, flocks of from ten to forty used to fly up the valleys of the Safed Koh to tree-limit (12,000 feet) every morning, and return at dusk.

[1033.] CERYLE VARIA. The Indian Pied Kingfisher.

Rattray, J. B. N. H. S. xii. p. 342 (common at Thall: nests in March); Ward, op. cit. xvii. p. 725 (very common up to 6,000 ft.).

A resident, but not very common, though found along most of the streams of the District, and in the Kurram Valley at least up to Dandar (4,700 feet).

[1035.] ALCEDO ISPIDA. The Common Kingfisher.

Rattray, J. B. N. H. S. xii. p. 342 (Thall: an uncommon resident); Marshall, op. cit. xv. p. 351 (Quetta: common in spring); Cumming, op. cit. xvi. p. 689 (a common resident in Seistan); Ward, op. cit. xvii. p. 725 (abundant in Kashmir up to 6,000 ft.).

Common in the cold weather.

It nests fairly commonly in the Miranzai and Kurram Valleys, but only a few pairs stay to breed in the plains around Kohat. It may often be seen hovering over water after the manner of *Ceryle varia*, if no perch is available

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[1044.] HALCYON SMYRNESIS. The White-breasted Kingfisher.

Rattray, J. B. N. H. S. xii. p. 342 (Thall: common): Ward, op. cit. xvii. p. 725 (occurs in Poonch).

Abundant in Kohat and up to Sadda (3,500 feet) in the Kurram Valley. A permanent resident. This bird picks up lizards and insects from the ground like a Shrike. In Kohat its favourite food consists of freshwater crabs. Major Magrath has also observed it taking locusts and dragon-flies on the wing.

[1066.] UPUPA EPOPS. The European Hoopoo.

Marshall, J. B. N. H. S. xv. p. 351 (Quetta: summer visitor); Fulton, op. cit. xvi. p. 58 (Chitral: summer visitor, occurring up to 14,000 ft.); Cumming, t. c. p. 690; Ward, op. cit. xvii. p. 726 (common in summer, rare in winter).

Abundant in Kohat in the cold weather, but only a few individuals stay to nest. Occurs in the Kurram Valley up to 8,000 ft., but is scarce.

[1068.] CYPSELUS MELBA. The Alpine Swift.

Rattray, J. B. N. H. S. xii. p. 342 (Thall: May); Marshall, op. cit. xv. p. 351 (Quetta: summer visitor); Fulton, op. cit. xvi. p. 58 (common in Chitral in summer from 5,000 to 16,000 ft.); Rattray, t. c. p. 660 (found two nests: Murree Hills); Ward, op. cit. xvii. p. 726.

Flocks of this fine Swift, often accompanied by the next species, pass through Kohat at intervals from mid-February till the end of May, returning in August and September. They merely pass over and do not stay.

[1069.] CYPSELUS APUS. The Common Swift.

Rattray, J. B. N. H. S. xii. p. 342 (Thall: common in May; shot two); Marshall, op. cit. xv. p. 351 (Quetta: common in summer; found nests in caves); Fulton, op. cit. xvi. p. 58 (Chitral; common in summer up to 14,000 ft.); Ward, op. cit. xvii. p. 726 (summer visitor: nests in cliffs).

Occurs like the last species and often in company with it. Breeds in small numbers in the cliffs of the Safed Koh, occurring up to the summit.

[1073.] CYPSELUS AFFINIS. The Common Indian swift.

Rattray, J. B. N. H. S. xii. p. 342 (rare at Thall); Marshall, op. cit. xv. p. 351 (common in summer); Ward, op. cit. xvii. p. 726.

Abundant from early in March till November, and appearing at intervals throughout the cold weather if the season is mild.

[1089.] CAPRIMULGUS MAHRATTENSIS. Sykes's Nightjar.

Rattray, J. B. N. H. S. xii. p. 342 (Thall); Cumming, op. cit. xvi. p. 690 (abundant in Seistan from April till September).

Nightjars are not common in the neighbourhood of Kohat, but round Thall the country is better suited to their habits and they are plentiful. We did not meet with this species, and are indebted to Col. Rattray for the following notes he made at Thall:—"Fairly numerous. The birds are not permanent residents, but arrive about the middle of May with *C. europæus*.

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I always found this species on the open hill-sides, and not amongst jungle. It breeds in the more open nullahs during June and July. I obtained four nests with eggs, the female in each case being shot on leaving the eggs. . . ."

Major Magrath procured several examples at Bannu.

[1090.] CAPRIMULGUS MONTICOLA. Franklin's Nightjar.

Rattray, J. B. N. H. S. xii. p. 343 (Thall).

The following details are again taken from notes made by Colonel Rattray at Thall:—"Common and a permanent resident. I found it breeding plentifully; all the eggs that I procured from five nests were laid without any depression, and were extremely highly coloured, being almost brick-red."

[1092.] CAPRIMULGUS EUROPÆUS. The common Nightjar.

Rattray, J. B. N. H. S. xii. p. 343 (Thall: commonest Nightjar in summer; found ten nests); Marshall, op. cit. xv. p. 351 (fairly common at Quetta summer); Rattray, op. cit. xvi. p. (661 not common in the Murree Hills).

Passes through Kohat in spring and autumn, and nests commonly in the scrub-jungle around Thall. I shot several examples.

[1104.] CUCULUS CANORUS. The Common Cuckoo.

Marshall, J.B.N.H.S. xv. p. 351 (Quetta: very common in March and April); Fulton, op. cit. xvi. p. 58 (Chitral: fairly common in summer); Rattray, t. c. p. 661 (abundant in the Murree Hills); Ward, op. cit. xvii. p.726; Magrath, op. cit. xviii. p. 296 (abundant at Thandiani, 9,000 ft., Hazara District).

The familiar call of the Cuckoo is heard in Kohat from early in April till nearly the middle of May. The bird is found up to the tree-limit on the Safed Koh, but is rather scarce. It continues calling there till well past the middle of July.

Major Magrath (l. c.) records his finding blue Cuckoo's eggs.

[1118.] COCCYSTES JACOBINUS. The Pied Crested Cuckoo.

Ward, J. B. N. H. S. xvii. p. 726 (Kashmir: not common, but several specimens were procured in the Valley).

Occurs rarely during the autumn migration. I have met with it on three occasions in August and September.

[1120.] EUDYNAMIS HONORATA. The Indian Koel.

Ward, J. B. N. H. S. xvii. p. 726.

I cannot do better than quote the following notes made by Major Magrath:—"A summer visitor in small numbers, much to the annoyance of *Corvus splendens*. In the early summer of 1905 there were probably not more than half a dozen birds in the station, but they made enough noise for a hundred. I picked up a dead fledgling in the month of August."

Arrives in Kohat about the middle of May.

[1138.] PALÆORNIS TORQUATUS. The Rose-ringed Parroquet.

Ward, J. B. N. H. S. xvii. p. 727.

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The following details are also from Major Magrath's notes:—"A resident, though scarce. There are probably not more than eight or a dozen in the District, all of which frequent cantonments. I know of only two trees where they nest, one a large cotton-tree (Simal) and the other a *Cirrus*. A tame example which I kept in a state of semi-freedom used often to mix with the wild birds, but the females, to whom he made advances, he invariably found, to his cost, appropriated."

[1141.] PALÆORNIS SCHISTICEPS. The Slaty-headed Parroquet.

Fulton, J. B. N. H. S. xvi. p. 58 (Chitral: summer visitor, occurring up to 7,000 ft.); Rattray, t. c. p. 661 (very common in the Murree Hills); Ward, op. cit. xvii. p. 727 (common in summer and autumn up to 7,500 ft.).

Flocks of this Parroquet visit the District during April (noted on various dates from the 8th to the 26th) and stay a few days. I came across a small nesting-colony on the 19th of June near Zeran, 5,800 feet (Kurram Valley); the young birds had just flown.

[1157.] ASIO ACCIPITRINUS. The Short-eared Owl.

Ward, J. B. N. H. S. xvii. p. 727 (occurs in the plains).

456. ♂ ad. Samana, 6,500 ft., 5th March.

Migrates through Kohat in March, but apparently only in small numbers.

[1159.] SYRNIUM BIDDULPHI. Scully's Wood-Owl.

Fulton, J. B. N. H. S. xvi. p. 58 (Chitral: not common, occurs up to 8,000 ft.); Ward, op. cit. xvii. p. 727 (fairly common in Kashmir; eggs taken in April and May).

90. ♂. Kohat, 1,760 ft., 19th January.

637. ♂. Hangu, 2,700 ft., 3rd March.

Fairly common from November till April in the orchards and wild olive-groves of the Kohat and Miranzai Valleys.

This species spends the day in evergreen trees, but without troubling much about concealment, being often mobbed by Crows, Mynas, Bulbuls, &c. An individual so mobbed was rescued and taken to Major Magrath, who kept it till dusk and then let it go. He says that it allowed him to handle it and scratch its head, and it appeared to be of a gentle disposition. He adds that the bird is a not uncommon winter visitor to Bannu.

[1164.] KETUPA ZEYLONENSIS. The Brown Fish-Owl.

668. ♂ ad. Kachai, 2,700 ft., 11th March.

Probably not rare, as the streams of the District are full of small fishes and crabs. The stomach of the above-mentioned example was crammed with fragments of crabs' shells and claws, with a few fish-bone.

Besides this example I shot one of a pair at Kohat in November.

[1168.] BUBO BENGALENSIS. The Rock-Horned Owl.

Rattray, J. B. N. H. S. xii. p. 343 (rare: Thall); Cumming, op. cit. xvi. p. 690 (Seistan: one young bird brought in); Ward, op. cit. xvii. p. 727 (common in Kashmir).

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Major Magrath writes as follows on this species :—"A resident and fairly common. An example I shot on the 13th of January, 1906, was put up in broad daylight from a nullah in which it had just pounced on a huge bull-frog. It flew away with its prey some distance and was killed on the ground. The vast flocks of *Pastor roseus* that roosted in the cantonments in August 1905 were much harried by Owls, this species being, as far as I could ascertain, the chief depredator."

This is the common Owl of the District.

[1180.] ATHENE BRAMA. The Spotted Owlet.

Ward, J. B. N. H. S. xvii. p. 727 (Kashmir.)

441. ♂. Kohat, 1,760 ft., 19th February.

549. ♂. Thall, 2,550 ft., 15th May.

A fairly common resident, not found about houses, as is usually the case, but only in cliffs in wild and desolate parts of the District, or occasionally in groves. In the cliffs near Thall it is particularly common, and this must, I think, be the species which Colonel Rattray took for *A. bactriana*. Curiously enough, in the adjoining District of Peshawar it occurs commonly about towns and villages.

[1191.] OTOGYPS CALVUS. The Black Vulture.

Ward, J. B. N. H. S. xvii. 728 (far from common in Kashmir).

Rare. I met with a pair near Siau in November 1905, and a solitary individual on the grass-farm in February 1908. These are the only examples that I have observed.

[1192.] GYPS FULVUS. The Griffon Vulture.

Rattray, J. B. N. H. S. xii. p. 343 (Thall: common); Marshall, op. cit. xv. p. 351 (Quetta: very common); Ward, op. cit. xvii. p. 728 (breeds in colonies and is resident).

Common throughout the District, especially on the Samana, where it breeds and is resident. Observed in the Kurram Valley up to 8,500 feet.

[1196.] PSEUDOGYPS BENGALENSIS. The Indian White-backed Vulture.

Rattray, J. B. N. H. S. xii. p. 343; Ward, op. cit. xvii. p. 728 (rare in Kashmir).

Colonel Rattray recorded this species from Thall, and made the following notes on it :—"Common on the plains round Thall; they were feeding on the dead transport animals all along the road from Kohat to Thall." This was during the Tirah Campaign of 1897-98, which doubtless attracted them to this part of the country, where in times of peace they are unknown. The nearest place where I have seen them is at Rawal Pindi, a hundred miles east of our limits, where, in October 1905, on the occasion of thirteen mules being shot, a great number, in company with *Gyps fulvus* and *Neophron percnopterus*, assembled in anticipation of the feast.

[1197.] PEOPHRON PERCNOPTERUS. The Egyptian Vulture.

Rattray, J. B. N. H. S. xii. p. 343 (Thall); Marshall, op. cit. xv. p. 351

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(Quetta : common in summer) ; Fulton, op. cit. xvi. p. 59 (Chitral : summer visitor from March till September) ; Rattray, t. c. p. 662 (common in the Murree Hills) ; Cumming, t. c. p. 691 (occasionally seen in Seistan) ; Ward, op. cit. xvii. p. 728.

The common Scavenger Vulture of the District. A resident everywhere, except on the Samana and in the Kurram Valley, which it leaves on the approach of winter, returning early in March with *Passer domesticus*. Scarce in the Kurram Valley, though we noted it up to the head (7,000 feet).

[1199.] GYPÆTUS BARBATUS. The Lammergeier.

Rattray, J. B. N. H. S. xii. p. 343 (common at Thall) ; Marshall, op. cit. xv. p. 352 (Quetta : very common and nests) ; Fulton, op. cit. xvi. p. 59 (Chitral : a common resident) ; Ward, op. cit. xvii. p. 928 (common ; nests in February and March).

Common and found everywhere from the plains to the summit of the Safed Koh, though seldom seen in the plains from June till October.

[1200.] AQUILA CHRYSÆTUS.

I have now seen the Golden Eagle in its summer-quarters in the Kaghan Valley, and feel fairly certain that the Eagle with the rufous-buff nape, which frequents the low rocky hills in Kohat in winter, is of this species. It is a regular visitor, but not common, and is not seen on the grass farm—the rendezvous of *A. heliaca, bifasciata, vindhiana,* and *maculata*—nor fighting over carrion, monitor lizards, &c., as these other species do, but is usually found singly in desolate country.

[1201.] AQUILA HELIACA. The Imperial Eagle.

Ward, J. B. N. H. S. xvii. p. 728 (an uncommon winter visitor).

A fairly common winter visitor. Mr. Donald has seen one give chase to a Laggar Falcon, and finally force it to drop its prey. Immature birds of this genus are frequently seen about the grass-farm feeding on offal, mole-rats, &c.

[1202.] AQUILA BIFASCIATA. The Steppe-Eagle.

Ward, J. B. N. H. S. xvii. p. 336 (abundant in Kashmir).

772. ♂ imm. Kohat, 1,900 ft., 1st April.

Fairly common in winter, but those seen were mostly immature birds.

[1203.] AQUILA VINDHIANA. The Tawny Eagle.

Rattray, J. B. N. H. S. xxii. p. 343 ; Ward, op. cit. xvii. p. 728.

Fairly plentiful in the cold weather and probably resident. Mr. Donald told me that in May 1907, when swarms of young locusts were devastating Kohat, he counted in one spot alone thirty-five of these Eagles which had apparently been gorging on the locusts. Colonel Rattray writes that in the Tirah Campaign he often saw this species feeding in company with Vultures on dead transport animals near Thall.

[1205.] AQUILA MACULATA. The Large Spotted Eagle.

Ward, J. B. N. H. S. xviii. p. 464 (Badarwa, Kashmir).

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One pair observed on the grass-farm and another at the Lachi reed-bed in April and May. Probably breeds in the neighbourhood.

[1207.] HIERAETUS FASCIATUS. Bonelli's Eagle.

Marshall, J. B. N. H. S. xv. p. 352 (Quetta: some breed in the hills); Ward, op. cit. xvii. p. 728 (not common in Kashmir).

A fairly common resident, very destructive to game. Mr. Donald, who has trained several of these birds, says that they are most courageous and will hawk anything they are entered to; but that they are wild and difficult to train, even when taken very early from the nest, and that through want of practice in flying they are usually rather unwieldy; added to which, owing to their marked partiality for poultry, they are somewhat unsatisfactory from a falconer's point of view. In the wild state they have a bad reputation for pursuing and killing trained Goshawks when they get the chance, and are said to be the worst enemies of the wild Goshawk. they hunt in pairs; their favourite quarry, if they can be said to have one, is perhaps the Wood-Pigeon, but little comes amiss, and they will snatch up a fowl when opportunity offers, or make off with a wounded duck.

Watched a pair building in a cleft in a cliff on 17th March.

[1216.] CIRCAETUS GALLICUS. The Short-toed Eagle.

Ward, J. B. N. H. S. xvii. p. 728.

Fairly common in winter, and perhaps resident.

[1220.] BUTASTUR TEESA. The White-eyed Buzzard-Eagle.

711. ♂ ad. Kohat, 1,760 ft., 19th March.

A summer visitor, arriving early in March and leaving towards the end of October. Breeds fairly commonly in the Miranzai and Samilzai Valleys.

[1223.] HALIAETUS LEUCORYPHUS. Pallas's Fishing-Eagle.

Cumming, J. B. N. H. S. xvi. p. 691 (Seistan); Ward, op. cit. xvii. p. 728 (Kashmir).

Resident and common along the River Indus. Mr. Donald found four pairs nesting there in March. Rare elsewhere; occasionally seen between Chikarkot and Hangu.

[1229.] MILVUS GOVINDA. The Common Pariah Kite.

Rattray, J. B. N. H. S. xii. p. 344 (Thall: very common); Marshall, op. cit. xv. p. 352 (Quetta: common, scarce in winter); Rattray, op. cit. xvi. p. 642 (common in the Galis); Ward, op. cit. xvii. p. 729.

532. ♀ ad. Peiwar Kotal, 8,000 ft., 25th April.

A very common resident up to 4,000 ft., occurring up to 8,000 ft. in summer. Major Magrath writes: "The numbers of this species were considerably reduced in the winter of 1905 by the excessive cold. The unfortunate birds were induced to breed early in January by the mildness of the weather, and had actually commenced to nest when the intense cold, lasting well into March, fell on us."

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[1230.] MILVUS MELANOTIS. The Large Indian Kite.

Rattray, J. B. N. H. S. xii. p. 344 (Thall: rare; shot a female off a nest); Fulton, op. cit. xvi. p. 59 (Chitral: April); Rattray, t. c. p. 663 (rare at Murree); Ward, op. cit. xvii. p. 729 (common in Kashmir).

Not common, more numerous on the Samana and in the Kurram Valley than elsewhere.

[1232.] ELANUS CÆRULEUS. The Black-winged Kite.

Fulton, J. B. N. H. S. xvi. p. 59 (common in Chitral in summer).

Fairly common in Kohat from early in April till October. In a mild year a few stragglers stay the winter. I met with it as high as Dandar (4,700 ft.) in the Kurram Valley.

[1223.] CIRCUS MACRURUS. The Pale Harrier.

Marshall, J. B. N. H. S. xv. p. 352 (Quetta: common in spring); Fulton, op. cit. xvi. p. 59 (Chitral: April).

739. ♂ ad. Kohat, 1,760 ft., 25th March.

This is the common Harrier of the District. Chiefly seen on migration from September till the end of November, and from February till May, only a few remaining for the winter.

[1234.] CIRCUS CINERACEUS. Montagu's Harrier.

Ward, J. B. N. H. S. xvii. p. 729 (winter visitor to Kashmir).

Rare. We both observed this species on the Samana during the spring migration. I also saw one near Lachi in March.

[1235.] CIRCUS CYANEUS. The Hen-Harrier.

Marshall, J. B. N. H. S. xv. p. 352 (occurs at Quetta in spring); Ward, op. cit. xvii. p. 729 (common in winter).

Fairly common on passage in spring and autumn.

[1237.] CIRCUS ÆRUGINOSUS. The Marsh-Harrier.

Marshall, J. B. N. H. S. xv. p. 352 (fairly common in winter); Ward, op. cit. xvii. p. 729 (very plentiful; possibly breeds in Kashmir).

Common about reed-beds and irrigated crops from September till the middle of May, especially in spring and autumn. Dresser, in his 'Manual of Palæarctic Birds' (p. 504), writing of this species, says: "It is doubtful if it dares even to attack a rat." I once disturbed a bird feasting on a freshly-killed adult *Nesokia hardwickii* (a particularly fierce species of field-rat), which I think must have been killed by the bird. I believe that a pair nested on the grass-farm at Kohat in the summer of 1906. They were there up to the 14th of June, when I left for the Kurram Valley. On my return in August I found an immature bird in the same spot.

[1239.] BUTEO FEROX. The Long-legged Buzzard.

Marshall, J. B. N. H. S. xv. p. 352 (common round Quetta in winter, chiefly the dark form; probably breeds close by).

A winter visitor and very common from October till April. I have shot both the light and the dark forms, but the former is much the commoner.

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[1241.] BUTEO DESERTORUM. The Common Buzzard.

Cumming, J. B. N. H. S. xvi. p. 691 (Seistan: one shot in February).

757. ♀. Kohat, 1,760 ft., 28th March.

A winter visitor, but by no means as common as the last species.

[1243.] ASTUR PALUMBARIUS. The Goshawk.

Ward, J. B. N. H. S. xvii. p. 729 (rare).

This species occurs on passage, but very rarely.

Mr. Donald says that nets are set in four or five gorges in the independent territory north of Kohat. These nets average twelve feet in height, have a two-inch mesh, and are made to fit roughly the bottom of the gorge, while they are so arranged as to collapse when struck by anything. The Goshawk is thus occasionally taken in spring and autumn. Bonelli's Eagle is its chief enemy and pursues both wild and trained birds for its prey. This is the favourite Hawk with the local Khans, but it is an expensive luxury, females costing from Rs. 150 to Rs. 200 and males from Rs. 50 to Rs. 70.

[1244.] ASTUR BADIUS. The Shikra.

Ward, J. B. N. H. S. xvii. p. 729 (Kashmir: rare).

A summer visitor, arriving towards the end of March. Nests commonly in the Samilzai Valley. Large numbers are snared by means of a light cage formed of fine netting stretched over supports, and covered with nooses; a live Quail is used as a bait. They are used for hawking Quail, and their price varies from 2*d.* to 1*s.*

[1247.] ACCIPITER NISUS. The Sparrow-Hawk.

Rattray, J. B. N. H. S. xii. p. 344 (Thall: occasionally seen; breeds in the Safed Koh); Marshall, op. cit. xv. p. 352 (not common; occurs in spring at Quetta); Fulton, op. cit. xvi. p. 59 (Chitral: shot one in May at 8,000 ft.); Ward, op. cit. xvii. p. 729 (a resident in Kashmir).

Occurs on migration in spring and autumn. Colonel Rattray mentions a young bird in down being brought to Parachinar in July from the Safed Koh. Mr. Donald tells me that this species breeds freely in Tirah, which lies just north of our limits, and that every autumn some thirty or forty individuals are snared along the Kachai stream, by means of a drop-net set up in the open, with a fine network cage containing Sparrows suspended in front. The Hawk seeing the sparrows flutter up makes a dash and gets entangled in the net. The bazaar rate varies from 2*s.* to 10*s.*

[1249.] *Pernis cristatus.* The Honey Buzzard. Occurs on spring migration.

[1254.] FALCO PEREGRINUS. The Peregrine Falcon.

Ward, J. B. N. H. S. xvii. p. 729 (common in Kashmir).

This species occurs chiefly on migration in spring and autumn, but is by no means common. Mr. Donald only knows of one instance of its being snared in the District, but has often observed it on passage. The bazaar rate for a good female is about Rs. 30.

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[1255.] FALCO PEREGRINATOR. The Shahin.

Rattray, J. B. N. H. S. xii. p. 344 (Thall: common along the foot of the hills); Ward, op. cit. xvii. p. 729 (occasionally caught near Srinagar).

A resident, and after the Laggar the commonest of our larger Falcons. Mr. Donald generally keeps a pair for hawking Chukor, Partridges, Teal, &c. He speaks highly of their courage, and has known one strike and kill a Mallard, but says that, though comparatively easy to train, after a year or two in captivity they deteriorate rapidly. There are many eyries scattered through the District. In June and July Mr. Donald has often seen them taking bats; these he thinks must be young birds practising.

Eggs were being incubated on 16th March. Alarm note, *kráp kráp*.

[1257.] FALCO JUGGER. The Laggar Falcon.

Marshall, J. B. N. H. S. xv. p. 352 (Quetta: fairly common); Ward, op. cit. xvii. p. 729.

Resident and common in open, cultivated country. Mr. Donald says that this species is the most frequent lure for taking other and more valuable Falcons. It is usually trained to take hares, but is not thought very much of, being too slow. The bazaar price is Re. 1.

[1258.] FALCO CHERRUG. The Cherrug or Saker.

The Cherrug occurs in open country like the last species, but is not nearly so common, and is a winter visitor only, arriving about October and leaving in April. Mr. Donald kept two birds which he trained very successfully to take *Milvus govinda* as well as Houbara-Bustards and Hares. After the Goshawk and Peregrine, this is the favourite amongst local falconers. The price ranges from Rs. 7 to Rs. 14 for a good female.

[1260.] FALCO SUBBUTEO. The Hobby.

Fulton, J. B. N. H. S. xvi. p. 60 (Chitral: one specimen obtained in May); Rattray, t. c. p. 663 (rare in the Murree Hills; breeds); Ward, op. cit. xvii p. 729 (breeds in the higher hills of Kashmir).

Mr. Donald states that this species is fairly common in spring and that he has observed it as late as May. I came across three individuals in beautiful adult plumage in February near Lachi; they were flying backwards and forwards, sparring at each other, and occasionally perching in a tree close by, while constantly uttering a cry which sounded like "gyak-gyak."

[1263.] ÆSALON REGULUS. The Merlin.

Ward, J. B. N. H. S. xvii. p. 729 (widely distributed in winter).

This bird is fairly common from October till the middle of March; it is more often seen about the grass-farm and the Sarma and Lachi plains than elsewhere. It migrates over the Samana in March. It is seldom trained in this district.

[1264.] ÆSALON CHICQUERA. The Red-headed Merlin or Turumti.

An occasional visitor, but by no means common. I have only twice seen

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it; on one occasion the bird shot down just in front of me to take a Starling flying in to roost, and started to tear it up close by, giving me a splendid view through my glasses. Mr. Donald says that he has met with this species in Kohat in most months of the year. He has a great opinion of its courage, and has trained it to take Rollers (a bird a great deal bigger than itself), while he has known a pair to tackle a Blue Rock-Pigeon. It is a fairly common resident, he says, in the adjoining districts of Peshawar and Mianwali. Major Magrath has also found it not uncommon in Bannu. The wide open plains of these districts are more to its liking than the confined valleys of Kohat.

[1265.] TINNUNCULUS ALAUDARIUS. The Kestrel.

Rattray, J. B. N. H. S. XII. p. 344 (a common resident at Thall); Marshall, op. cit. xv. p. 352 (Quetta: common; found many nests); Fulton, op. cit. xvi. p. 60 (Chitral: a very common resident from 4,000 ft. upwards; one seen at 18,000 ft.); Rattray, t. c. p. 663 (common in the Murree Hills); Ward, op. cit. xvii. p. 729.

753. ♂. Kohat, 1,760 ft., 27th March.
764. ♂. „ „ 23rd March.

Common in winter; a resident on the Samana and in the Kurram and Miranzai Valleys (nesting regularly at Thall, 2,550 ft., and Hangu, 2,700 ft.).

[1292.] COLUMBA INTERMEDIA. The Indian Blue Rock-Pigeon.

Rattray, J. B. N. H. S. xii. p. 344 (Thall: common in winter); Marshall, op. cit. xv. p. 352 (a resident, at Quetta); Fulton, op. cit. xvi p. 60 (Chitral: resident, occurring up to 10,000 ft.); Cumming, t. c. p. 691 (occurs in Seistan); Ward, op. cit. xvii. p. 943 (Kashmir).

Occurs in large flocks in the District from August to April. A few appear to be resident round Thall, but the great majority leave in April. Colonel Rattray, in his article referred to above, says that "they were breeding in hundreds in a cliff near the Fort. About the middle of April they all disappeared suddenly." On the 19th of May, 1907, however, I found some still about the cliffs at Thall.

[1293.] COLUMBA LIVIA. The Blue Rock-Pigeon.

Rattray, J. B. N. H. S. xii. p. 344 (Thall: large flocks occur in winter); Marshall, op. cit. xv. p. 352 (Quetta); Ward, op. cit. xvii. p. 943 (the common Pigeon of Kashmir).

Occurs with flocks of the last species in winter, but is much less common. Never observed in separate flocks.

[1295.] COLUMBA EVERSMANNI. The Eastern Stock-Dove.

Cumming, J. B. N. H. S. xvi. p. 691 (Seistan: April); Ward, op. cit. xvii. p. 943 (Kashmir: rare, occurs on migration).

Migrates through Kohat in the latter half of April in small flocks which feed chiefly on the mulberries that are then ripening. Less wary than

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other members of the genus. Appears to be scarce in the Kurram Valley, and probably only passes through, I shot an example at 6,500 feet in Ilex-scrub on the 2nd of May.

[1298.] PALUMBUS CASIOTIS. The Eastern Wood-Pigeon.

Marshall, J. B. N. H. S. xv., p. 352 (common on the hills round Quetta); Ward, op. cit. xvii., p. 943 (Kashmir).

A resident species, collecting in large flocks in autumn in the scrub-jungle above Marai, about Shinauri, and in the wooded nullahs of the northern slopes of the Samana—these being its favourite haunts, but odd birds occur all over the District. Mr. Donald tells me that it nests freely near the Zera Kotal, above Shinauri, and north of the Samana. It occurs also in the Kurram Valley, and probably breeds there, but was still in flocks in May.

[1305.] TURTUR FERRAGO. The Indian Turtle-Dove.

Fulton, J. B. N. H. S. xvi., p. 60 (common in Lower Chitral in summer); Rattray, t. c., p. 663 (common in the Murree Hills); Ward, op. cit. xvii., p. 943 (common in Kashmir).

Small numbers migrate through Kohat from mid-April till the 3rd or 4th of May, returning in September and October. Mr. Donald has found it nesting on the Samana, I shot a specimen there as late as the 4th of November. It is common in summer in the woods of the Safed Koh, from 7,000 feet to tree-limit.

[1309.] TURTUR CAMBAYENSIS. The Little Brown Dove.

Rattray, J. B. N. H. S. xii., p. 344 (Thall: common); Marshall, op. cit. xv., p. 353 (resident at Quetta, largely reinforced in summer); Fulton, op. cit. xvi., p. 60 (Chitral: probably common); Ward, op. cit. xvii., p. 943 (Kashmir).

A resident in the District and abundant at all seasons. Common in the Kurram Valley in summer up to 6,500 feet, and occurring at least up to 8,000 feet, at which height Major Magrath shot an example.

[1310.] TURTUR RISORIUS. The Indian Ring-Dove.

Rattray, J. B. N. H. S. xii., p. 344 (Thall: common); Marshall, op. cit. xv., p. 355 (common summer visitor); Fulton, op. cit. xvi., p. 60 (common in summer); Cumming, t. c. p. 691 (very rare in Seistan); Ward, op. cit. xvii., p. 943 (Kashmir).

Abundant in summer, the majority leaving in autumn, though many stay the winter. In the Kurram Valley the bird is common up to Dandar, but rather scarce higher up. I have met with it, however, as high as 8,500 feet.

[1311.] ŒNOPOPELIA TRANQUEBARICA. The Red Turtle-Dove.

Rattray, J. B. N. H. S. xii., p. 345 (rare at Thall); Ward, op. cit. xvii., p. 943 (rare in Kashmir).

A summer visitor to the District, and fairly numerous from the second week in April till August.

[1316.] PTEROCLES ARENARIUS. The Black-bellied Sand-Grouse.

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Rattray, J. B. N. H. S. xii., p. 345 (Thall: passes through in March); Marshall, op. cit. xv., p. 353 (Quetta: common in autumn and spring); Cumming, op. cit. xvi., p. 691 (said to occur in Seistan); Ward, op. cit. xvii., p. 943 (Jummu).

Large flocks occur in the cold weather in the fields around Doaba and occasionally round Kohat, Lachi, and Dhand. I flushed a bird on the 21st of June, 1906, on the stony plain near Dandar in the Kurram Valley, which was possibly breeding in the neighbourhood.

[1317.] PTEROCLES FASCIATUS. The Painted Sand-Grouse.

Ward, J. B. N. H. S. xvii., p. 944 (Jummu).

A rare bird, probably resident. Mr. Donald told me that he had frequently flushed a pair of strange Sand-Grouse in the scrub-jungle west of Shinauri (3,800 feet), but that for a long time they managed to escape. Eventually, however, one was brought to bag and on being compared with Hume and Marshall's 'Game Birds of India' was found to correspond exactly with this species. This is not the first record of its occurrence west of the Indus. In 1902, Major Barton, of the Guides, sent a skin to the Bombay Natural History Society, and in a note to the Journal (vol. xiv., p. 606) wrote that the bird was shot every year near Mardan and that it was said to be resident.

[1321.] PTEROCLURUS EXUSTUS. The Common Sand-Grouse.

A resident in Kohat, but not very common. *Pteroclurus alchata* should occur, but we have not met with it, nor has Mr. Donald.

[1342.] LOPHOPHORUS REFULGENS. The Monál.

Fulton, J. B. N. H. S. xvi., p. 61 (common in Lower Chitral); Ward, op. cit. xvii., p. 944 (common in Kashmir).

Fairly numerous on the Safed Koh from 9,000 feet to tree-limit. I came across young ones fairly strong on the wing on the 27th of June.

[1355.] COTURNIX COMMUNIS. The Grey Quail.

Rattray, J. B. N. H. S. xii., p. 345 (Thall: passes through in spring and autumn, a few are resident); Marshall, op. cit. xv., p. 353 (Quetta: a few occur in spring and autumn); Fulton, op. cit. xvi., p. 61 (Chitral: passes through in spring, a few stay); Cumming, t. c., p. 692 (Seistan: fairly common; nests in March and April); Ward, op. cit. xvii., p. 944 (summer visitor, nesting).

Passes through in varying numbers from about the third week in March till the middle of May, and returns in August and September. Forty-six brace to two guns is the best morning's bag that I remember being made. Every year a few pairs stay to nest. Colonel Rattray found four eggs on the 21st of April near Thall. Mr. Donald has come across several nests, on one occasion actually treading on the sitting bird.

[1356.] COTURNIX CORAMANDELICA. The Rain Quail.

Ward, J. B. N. H. S. xvii., p. 944. (A rare visitor: has been known to nest in Kashmir.)

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Two or three examples are yearly shot in Kohat about May; the bird probably nests in the District.

[1370.] CACCABIS CHUCAR. The Chukor.

Rattray, J. B. N. H. S. xii. p. 345 (Thall: a common resident); Marshall, op. cit. xv. p. 353 (Quetta: very common); Fulton, op. cit. xvi. p. 61 (very common, ranging up to 12,000 ft.); Ward, op. cit. xvii p. 944 (found everywhere in Kashmir).

662. Seu? Marai, 3000 ft., 9th March.

763. ♀ ad. Kohat, 1850 ft., 30th March.

Resident, and fairly numerous from the plains up to at least 11,000 feet in the Safed Koh.

[1371.] AMMOPERDIX BONHAMI. The Sisi Partridge.

Rattray, J. B. N. H. S. xii. p. 345 (Thall: a fairly common resident); Marshall, op. cit. xv. p. 353 (Quetta: very common); Cumming, op. cit. xvi. p. 692 (Seistan: scarce).

A common resident on the stony hills of Kohat and the Kurram Valley up to about 6,000 feet, and abundant in the more remote parts, where it is less persecuted.

[1372.] FRANCOLINUS VULGARIS. The Black Partridge.

Rattray, J. B. N. H. S. xii. p. 345 (Thall: abundant); Marshall, op. cit. xv. p. 353 (Quetta: occurs about the foot-hills); Cumming, op. cit. xvi. p. 692 (Seistan: abundant).

A resident, and common in the Mazri scrub (dwarf-palm) of the Lower Kurram and Upper Miranzai Valleys, and, in fact, wherever there is plenty of Mazri.

[1375.] FRANCOLINUS PONDICERIANUS. The Grey Partridge.

Rattray, J. B. N. H. S. xii. p. 345 (Thall: very common); Ward, op. cit xvii. p. 944 (Kashmir: occurs in the plains).

A resident and fairly numerous, but less so than the Sisi. It is found on much the same ground, though more frequently about cultivated spots, and up to about the same altitude in the Kurram Valley.

[1378.] TETRAOGALLUS HIMALAYENSIS. The Himalayan Snow-Cock.

Fulton, J. B. N. H. S. xvi. p. 62 (Chitral: found in winter down to 6,000 ft. and in summer up to 16,000 ft.); Ward, op. cit. xvii. p. 945) (common at high altitudes).

This grand bird occurs in summer on the upper slopes of the Safed Koh from about 9,000 feet to the summit, but is rather scarce. Like the Chuko it would often escape notice were it not so noisy.

[1384.] TURNIX TANKI. The Indian Button-Quail.

A summer visitor in small numbers, breeding on the grass-farm. Major Venour shot one at Christmas 1909, so probably a few are resident.

[1387.] RALLUS AQUATICUS. The Water-Rail.

Ward, J. B. N. H. S. xvii. p. 945 (breeds in the Valley of Kashmir).

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402. ♂. Dhand, 1,200 ft., 17th November 1906.

869. Kohat, 1,700 ft., 8th March.

These two were the only ones met with.

[1393.] PORZANA PUSILLA. The Eastern Baillon's Crake.

Rattray, J. B. N. H. S. xii. p. 345 (large numbers pass through about the end of May); Ward, op. cit. xvii. p. 945 (Kashmir).

692, 693. ♀ ♀ ads. Lachi, 1,540 ft., 17th March.

Capt. Keen shot the first example on the 11th of February, 1906, and from then till mid-April single individuals were met with at intervals. About the latter date the main body appeared, and up to the 20th of May large numbers continued to pass through, frequenting the grass-farm, irrigated crops, and cover near water. The bird has not been observed on the autumn migration, though common at Rawal Pindi (120 miles east) at that season.

[1394.] PORAZANA MARUETTA. The Spotted Crake.

695. ♂ ad. Lachi, 1540 ft. 17th March.

Passes through Kohat in fair numbers in March and April, frequenting reed-beds and irrigated crops. A great skulker, but may frequently be located by its peculiar loud call-note.

[1398.] AMAURORNIS FUSCUS. The Ruddy Crake.

Ward, J. B. N. H. S. xvii. p. 945 (breeds in Kashmir).

281. ♂ ad. Dandar, 4,700 ft., 23rd June, 1906.

I found numerous nests of this species in a marsh near Dandar, in the Kurram Valley. They were usually fairly well concealed in clumps of reeds or grass, and generally mere hollows scantily lined with bits of these plants. The first eggs are laid about the middle of June, the clutch varying from five to seven. In colour they are creamy-white profusely spotted with pale red, and the average measurements are 1·22 × ·82 in. This species has brought the art of skulking to a high state of perfection, and it is only when the young have emerged from the shell that it shews itself at all.

[1402.] GALLINULA CHLOROPUS. The Water-Hen.

Ward, J. B. N. H. S. xvii. p. 945 (Kashmir).

A rather scarce winter visitor to Kohat; more numerous at Dhand than elsewhere. It occurs chiefly on migration in March and April, when it is frequently caught. It breeds in the Kurram Valley in small numbers. I found a nest at Dandar on the 9th of July.

[1405.] FULICA ATRA. The Coot.

Marshall, J. B. N. H. S. xv. p. 353 (Quetta: common in winter); Fulton, op. cit. xvi. p. 62 (Chitral: shot in March at Drosh); Cumming, t. c. p. 693 (Seistan: a common resident); Ward, op. cit. xvii. p. 945 (Kashmir).

Abundant on Dhand tank throughout the cold weather, occurring also in other suitable places in small numbers. I met with a pair near Lachi as late as the 20th of May, so possibly a few are resident.

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[1407.] GRUS COMMUNIS. The Common Crane.

Rattray, J. B. N. H. S. xii., p. 345 (passes over Thall in great numbers: often driven back after storms).

Large flocks pass over from the third week in February till the end of March, returning in August and September, but rarely halting except in the Latammar Nullah or at Dhodha.

Residents at Parachinar say that Cranes on migration fly straight over the Safed Koh Range (lowest point 11,760 feet) and not round the western shoulder, but that they are frequently forced to turn back by storms Major Magrath, too, has often observed them returning S.E. to Bannu after a storm.

[1411.] ANTHROPOIDES VIRGO. The Demoiselle Crane.

Rattray, J. B. N. H. S. xii., p. 346 (Thall); Cumming, op. cit. xvi., p. 393 (Seistan: a few occur in February and March); Ward, op. cit. xvii, p. 945 (a winter visitor to Kashmir).

This beautiful species passes through in big flocks from the end of March till about the middle of April (last flock seen on the 17th), returning in September.

[1413.] OTIS TETRAX. The Little Bustard.

Ward, J. B. N. H. S. xvii., p. 945 (Kashmir: one shot in December).

Very rare. We have never met with this species, but Mr. Donald says that he has twice flushed the "Butterfly" Bustard, as he calls it, from its peculiar flight, when hawking the Houbara.

[1415.] HOUBARA MACQUEENI. The Houbara Bustard.

Marshall, J. B. N. H. S. xv., p. 353 (passes through Quetta in March and April); Cumming, op. cit. xvi., p. 693 (fairly common in Seistan in spring: said to breed).

A rather scarce winter visitor, but fairly plentiful on the spring migration in March. Mr. Donald frequently takes this Bustard with his trained Cherrug Falcons (*Falco cherrug*).

[1418.] ŒDICNEMUS SCOLOPAX. The Stone-Curlew.

Marshall, J. B. N. H. S. xvi., p. 353 (rare at Quetta); Ward, op. cit. xvii., p. 945 (Kashmir).

I only once met with this species in Kohat and that was near Sheikhan on the 22nd of August, 1906. Mr. Donald says that it occurs commonly in the desert-country between Samrud and the mouth of the Khyber Pass, *i.e.*, about 40 miles N. E. of Kohat.

[1427.] GLAREOLA LACTEA. The Small Indian Pratincole.

Rattray, J. B. N. H. S, xii., p. 346 (Thall); Ward, op. cit. xvii, p. 945 (said to occur in Kashmir).

A summer visitor from April till August. Col. Rattray found it breeding freely on the gravel banks in the Kurram River in April. It was very common when we passed through Thall in April and on our return in May.

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Major Venour saw three Swallow Plover at close quarters in spring 1909 which were not of this species but were either *G. orientalis* or *G. pratincola*.

[1431.] SARCOGRAMMUS INDICUS. The Red-wattled Plover.

Rattray, J. B. N. H. S. xii., p. 346 (common at Thall); Marshall, op. cit. xv. p. 353 (only one seen at Quetta, 5,600 ft.); Ward, op. cit. xvii., p. 946 (a few occur at about 5,000 ft. in Kashmir).

A few are resident in the plains; abundant in summer, but scarce in winter.

[1436.] VANELLUS VULGARIS. The Lapwing.

Rattray, J. B. N. H. S. xii., p. 346 (a few pass through Thall); Marshall, op. cit. xv., p. 353 (winter visitor to Quetta); Fulton, op. cit. xvi., p. 62 (Chitral: fairly common up to the end of May; probably breeds); Ward, op. cit. xvii., p. 946 (winter visitor).

Fairly common from October till the third week in March.

[1437.] CHETTUSIA GREGARIA. The Sociable Plover.

Rattray, J. B. N. H. S. xii., p. 346 (large flocks pass through Thall in April); Fulton, op. cit. xvi., p. 62 (Chitral: common in winter; saw some at Drosh, 4,300 ft., at the end of May, probably breeds about there); Ward, op. cit. xvii., p. 946 (scarce in Kashmir).

Small flocks pass through from the last week in February till the end of March: many are then in full plumage, *i.e.*, are black and chestnut on the abdomen (see Blanford, Fauna of B. I. vol. iv., p. 232). A solitary example was shot on the parade-ground at Fort Lockhart (6,500 feet), where it had alighted during parade.

[1438.] CHETTUSIA LEUCURA. The white-tailed Plover.

Cumming N. L., J. B. N. H. S. xvi., p. 694 (Seistan, 6th May.)

Mr. Donald shot a specimen on the grass-farm on the 31st of March 1905, and sent it to Major Magrath for identification. This is the only occurrence in Kohat that I know of. In Bannu, however, it is very common in winter about the larger marshes.

[1446.] ÆGIALITIS ALEXANDRINA. The Kentish Plover.

A somewhat rare spring visitor, arriving towards the end of February and disappearing before the end of March. Major Magrath has found it common in Bannu in spring and autumn.

[1447.] ÆGIALITIS DUBIA. The Little Ringed Plover.

Rattray, J. B. N. H. S. xii., p. 346 (Thall); Marshall, op. cit. xv., p. 353 (common at Quetta in spring); Cumming, op. cit. xvi., p. 694 (fairly plentiful in Seistan); Ward, op. cit. xvii., p. 946 (Kashmir).

This species passes through Kohat in small flocks from about the end of February till the middle of May (last seen on the 20th). The numbers vary a good deal. In the spring of 1905 Major Magrath noticed a great many passing through, but in the following year comparatively few were seen. On the gravelly shores of the Kurram it breeds abundantly from Thall up to

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Dandar at least; Colonel Rattray found many nests near Thall, from the end of May onwards.

I once saw an individual trying to escape observation by lying flat on the ground with head and neck extended, after the fashion of the Stone-Curlew.

[1451.] HIMANTOPUS CANDIDUS. The Black-winged Stilt.

Marshall, J. B. N. H. S. xv., p. 353 (Quetta: common in March); Cumming, op. cit. xvi., p. 694 (scarce in Seistan); Ward, op. cit. xvii., p. 946 (breeds in Kashmir).

A rather rare visitor to Kohat from March till May (last seen on the 28th). Major Magrath says that it is very common in Bannu in spring.

[1460.] TOTANUS HYPOLEUCUS. The Common Sandpiper.

Marshall, J. B. N. H. S, xv., p. 353 (Quetta: occurs in April, but is rare); Fulton, op. cit. xvi., p. 62 (Chitral: one shot on May 30th); Ward, op. cit. xvii., p. 946 (breeds in Kashmir).

Occurs on passage in the spring and autumn, a few staying the winter.

[1461.] TOTANUS GLAREOLA. The Wood-Sandpiper.

Fulton, J. B. N. H. S. xvi., p. 62 (Chitral: one shot on the 6th of May). Cumming, t. c., p. 695 (common in Seistan in May); Ward, op. cit. xvii., p. 946 (Kashmir).

Occurs in numbers on the spring migration in the irrigated fields round Kohat.

[1462.] TOTANUS OCHROPUS. The Green Sandpiper.

Marshall, J. B. N. H. S. xv., p. 353 (Quetta: common in winter; Fulton, op. cit. xvi., p. 63 (common in spring; believed to breed in Chitral; many found between 9,000 and 14,000 ft. in July); Ward, op. cit. xvii., p. 946 (Kashmir).

Abundant on migration in April and May, and from the end of August till November; the majority leave about that time, but many stay the winter in the plains, and a few non-breeding birds through the summer. It passes up the Kurram Valley in spring in great force, but does not stay to breed.

[1463.] TOTANUS STAGNATILIS. The Marsh-Sandpiper.

Not at all common, but a few individuals pass through every year between February and the middle of May, being generally found about the irrigated parts of the grass-farm.

[1464.] TOTANUS CALIDRIS. The Redshank.

Cumming, J. B. N. H. S. xvi., p. 695 (Seistan); Ward, op. cit. xvii., p. 946, and xviii.; p. 464 (fairly common in Kashmir in winter; breeds in Ladak).

I have only met with one solitary example, and that was on the 17th of March near Lachi. Major Magrath, however, has found the bird very common in Bannu in winter.

[1466.] TOTANUS GLOTTIS. The Greenshank.

Ward, J. B. N. H. S. xvii., p. 946 (Kashmir).

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A fairly common cold-weather visitor, arriving in October and leaving towards the end of April.

[1468.] PAVONCELLA PUGNAX. The Ruff.

Marshall, J. B. N. H. S. xv., p. 353 (Quetta: one shot in February); Ward, op. cit. xvii, p. 946 (a winter visitor to Kashmir).

Occurs in large flocks on the grass-farm and other suitable places from the end of February till the middle of May (I shot a single bird on the 17th).

[1471.] TRINGA MINUTA. The Little Stint.

Fulton, J. B. N. H. S. xvi., p. 63 (common in Chitral in April and May); Ward, op. cit. xvii., p. 946 Kashmir).

Appears in small flocks towards the end of March, and is abundant about irrigated fields and shallow tanks, in company with Sandpipers, till the middle of May. Not met with in autumn.

[1474.] TRINGA TEMMINCKI. Temminck's Stint.

Arrives and leaves about the same time as the little stint, but unlike that species is almost always found singly. I have only once met with it in autumn.

[1482.] SCOLOPAX RUSTICULA. The Woodcock.

Rattray, J. B. N. H. S. xii., p. 354 (Thall: a rare winter visitor); Marshall, op. cit. xv., p. 354 (Quetta: winter visitor); Fulton, op. cit. xvi., p. 63 (resident in Lower Chitral, but scarce); Rattray, t. c., p. 663 (nests freely in the Murree Hills above 8,500 ft.); Cumming, t. c., p. 695 (scarce in Seistan); Ward, op. cit. xvii., p. 946 (breeds in Kashmir).

A winter visitor from November till the middle of March, but not common: there are, however, several favoured spots in the district which can usually be counted on to hold one bird or more. In the gardens of Kohat itself some half-dozen are shot every winter.

[1484.] GALLINAGO CŒLESTIS. The Common Snipe.

Rattray, J. B. N. H. S. xii., p. 346 (Thall: common in March); Marshall, op. cit. xv., p. 354 (Quetta: fairly common); Fulton, op. cit. xvi., p. 63 (Chitral: a few noticed in April); Cumming, t. c., p. 695 (Seistan: abundant from September to April); Ward, op. cit. xvii., p. 947 (breeds in Kashmir).

Passes through in varying numbers from the last week in January till the middle of April. Few stay in Kohat, but in the Kurram Valley, where there is plenty of good feeding-grounds, bags of fifty and sixty couples of this and the next species are often made in a few hours. On the return passage in autumn comparatively few halt.

[1487.] GALLINAGO GALLINULA. The Jack Snipe.

Rattray, J. B. N. H. S. xii., p. 347 (Thall); Marshall, op. cit. xv., p. 354 (Quetta: occasionally met with); Cumming, op. cit. xvi., p. 695 (Seistan: said to be fairly common); Ward, op. cit. xvii., p. 947 (Kashmir).

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The same may be said of this bird as of the last, but it is not quite so common.

[1488.] ROSTRATULA CAPENSIS. The Painted Snipe.

Rattray, J. B. N. H. S. xii., p. 347 (Thall in March); Ward, op. cit. xvii., p. 947 (a resident in the Kashmir Valley).

Rare in Kohat. Capt. Keen shot a specimen in April 1904, while Mr. Donald and Major Venour shot several early in July 1907 and saw others. In the Kurram Valley it is a permanent resident, but is not common.

[1498.] HYDROPROGNE CASPIA. The Caspian Tern.

Rattray, J. B. N. H. S. xii., p. 347 (Thall); Cumming, op. cit. xvi., p. 696 (common in Seistan).

Colonel Rattray saw a party of seven near Thall on the 22nd of May and shot one. Capt. Keen and Mr. Boyle observed a large solitary Tern on the Toi near Hangu between the 20th and 26th of March, 1906, and from their description it must, I think, have belonged to this species.

[Major Magrath has also met with *Larus ridibundus* and *L. cachinnans* in Bannu, and as they both occur in Kashmir, they probably also do so in the Kurram Valley.]

[1499.] STERNA ANGLICA. The Gull-billed Tern.

Rattray, J. B. N. H. S. xii., p. 347 (Thall: common in March); Cumming, op. cit. xvi., p. 696 (Seistan: common).

Small flocks pass through Kohat from the beginning of April till May (last seen on the 5th), and are then usually to be met with about the grass farm or feeding in irrigated fields.

[1504.] STERNA MELANOGASTER. The Black-bellied Tern.

Cumming, J. B. N. H. S. xvi., p. 696 (Seistan: not common).

Major Magrath observed this species in some irrigated fields near Doaba on the 18th of May 1907. In Bannu he says that it is common.

[1526.] PHALACROCORAX CARBO. The Common Cormorant.

Marshall, J. B. N. H. S. xv., p. 354 (Quetta: a few seen in March).

A fairly common bird on the Indus between Khushalgarh and Makhud. It also occurs occasionally up the Kohat Toi; Capt. Lyall sent me a specimen that he had shot on this stream near Hangu.

[1527.] PHALACROCORAX FUSCICOLLIS. The Indian Shag.

Rattray, J. B. N. H. S. xii., p. 347.

Colonel Rattray shot an example near Thall in February, 1898, after a heavy storm in the Kurram Valley: it was the only one that he saw. We have never met with this species.

[1544.] PLEGADIS FALCINELLUS. The Glossy Ibis.

1. Juv. Kohat, 1,760 ft., 22nd August.

The only example that we have seen was a bird of the year which Mr. Donald shot in his garden on the 22nd of August, 1905, and sent to

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Major Magrath, who forwarded the skin to the Secretary of the Bombay Natural History Society. Mr. Donald flushed another on the grass-farm.

[1545.] PLATALEA LEUCORODIA. The Spoonbill.

Rattray, J. B. N. H. S. xii., p. 347 (Thall: a big flock at the end of May).

I came across four Spoonbills on the grass-farm on the 30th of May, 1906. The following year, on the 30th of April, Major Magrath and I were standing on the Peiwar Kotal (8,200 feet) when a flock of about twenty came up from the Kurram and passed close overhead; but apparently not relishing the strong north-west wind which met them as they topped the Kotal (*i.e.* pass), they wheeled round and flew back down the valley.

[1546.] CICONIA ALBA. The White Stork.

Occurs regularly on the spring migration either singly or in small parties. In the Kurram Valley we saw a flock of some two hundred near Dandar on the 20th of April. Single individuals continue to pass through up till the end of May.

[1547.] CICONIA NIGRA. The Black Stork.

Ward, J. B. N. H. S. xvii., p. 947 (occurs early in spring in Kashmir).

Not common; but small flocks are seen every winter from January till the end of March.

[1554.] ARDEA MANILLENSIS. The Eastern Purple Heron.

I flushed three individuals out of the Lachi reed-bed on the 20th of May 1906. Major Magrath and I also came on a small flock in the reeds at Dandar in the Kurram Valley in April 1907. These are the only occasions on which we have met with this Heron.

[1555.] ARDEA CINEREA. The Common Heron.

Rattray, J. B. N. H. S. xii., p. 347 (Thall: one or two always about); Marshall, op. cit. xv., p. 354 (Quetta: common, especially in March); Fulton, op. cit. xvi., p. 63 (only a few seen in Chitral); Cumming, t. c., p. 696 (common in Seistan); Ward, op. cit. xvii., p. 947 (abdundant in the Vale of Kashmir).

Fairly common in suitable places, especially along the Kurram River. Probably a resident species.

[1559.] HERODIAS ALBA. The Large Egret.

Rattray, J. B. N. H. S. xii., p. 347 (Thall); Marshall, op. cit. xv. p. 354 Quetta: fairly common in February); Ward, op. cit. xvii., p. 947 (Kashmir).

Colonel Rattray writes:—"A few birds appeared at Thall in the middle of May for a day or two; one was shot and brought to me, it was in splendid breeding-plumage."

We have not met with this species ourselves in Kohat, though Major Magrath has found it quite common in Bannu in winter.

[1565.] ARDEOLA GRAYI. The Pond-Heron.

Ward, J. B. N. H. S. xvii., p. 947 (breeds in Kashmir).

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Abundant in the plains in summer, arriving in the beginning of April, and nesting freely in the cantonments. A few stay through the winter, if fairly mild.

[1568.] NYCTICORAX GRISEUS. The Night-Heron.

Rattray, J. B. N. H. S. xii., p. 347 (rare, but presumably resident at Thall); Ward, op. cit. xvii., p. 947 (breeds in Kashmir).

Personally I have only met with this species in summer from April onwards; but a few individuals appear to be resident, as Colonel Rattray observed it at Thall in winter, and Major Magrath at Bannu. It occurs in Kohat and the Kurram Valley (up to 4,800 feet at least), but is not common.

[1570.] ARDETTA MINUTA. The Little Bittern.

Cumming, J. B. N. H. S. xvi., p. 696 (Seistan: one specimen); Ward, op. cit. xvii., p. 948 (breeds in Kashmir).

I found a nest with seven slightly incubated eggs in a reed-bed near Dandar on the 9th of July, 1906, and shot the male bird. The nest was a flat pad of reeds on a stump, three feet above the water. I have several times put up a Little Bittern, either this species or *A. sinensis*, in the reed beds in the plains in April and May, but have not secured a specimen, so cannot say to which species it belonged.

[1574.] BOTAURUS STELLARIS. The Bittern.

Rattray, J. B. N. H. S. xii., p. 347 (Thall: very rare); Cumming, op. cit xvi., p. 696 (Seistan: one shot in December); Ward, op. cit. xvii., p. 947 (a winter visitor, but not common).

72. Adult. Kohat, 1,600 ft., 7th January.

A fairly common winter visitor, both to Kohat and the Kurram Valley. Leaves early in April (last seen on the 8th).

[1579.] ANSER FERUS. The Grey Lag-Goose.

Cumming, J. B. N. H. S. xvi., p. 697 (common in Seistan in winter); Ward, op. cit. xvii., p. 948 (abundant in winter).

Mr. Donald has shot this species on the grass-farm; but it is very rare in Kohat, though occurring regularly in the Kurram Valley in spring.

[1588.] CASARCA RUTILA. The Brahminy Duck or Ruddy Sheldrake.

Rattray, J. B. N. H. S. xii., p. 347 (rare at Thall); Marshall, op. cit. xv., p. 354 (Quetta: occurs in February and March); Ward, op. cit. xvii., p. 948 (a winter visitor to Kashmir, breeds in Ladak).

Passes through Kohat from the middle of February till the middle of April, but is not common.

[1587. TADORNA CORNUTA (S. G. Gm.). Major Magrath writes that the Sheldrake is a regular spring visitor to Bannu in small numbers.]

[1592.] ANAS BOSCAS. The Mallard.

Rattray, J. B. N. H. S. xii., p. 347 (Thall: common in March); Marshall, op. cit. xv., p. 354 (Quetta: common in winter); Fulton, op. cit. xvi., p. 64

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(passes through Chitral); Cumming, t. c., p. 697 (Seistan: common); Ward, op. cit. xvii., p. 947 (a few nest in Kashmir).

A winter visitor and one of our commonest Ducks; it disappears towards the end of March.

[1595.] CHAULELASMUS STREPERUS. The Gadwall.

Rattray, J. B. N. H. S. xii., p. 348 (Thall: common in March); Cumming, op. cit. xvi., p. 697 (not common in Seistan); Ward, op. cit. xvii., p. 948 (Kashmir).

Scarce in winter, but becoming fairly numerous in spring. Some stay very late. I shot an individual out of a party of three on one of the reedy tanks near Lachi on the 20th of May, 1906; they appeared to fly quite well. I was unable to visit this spot again before autumn, so cannot say whether the bird nests there or not. Colonel Rattray also writes:—"One male was shot out of a party of three in June [at Thall] and brought to me."

[1597.] NETTIUM CRECCA. The Common Teal.

Rattray, J. B. N. H. S. xii., p. 348 (Thall: very common in spring); Marshall, op. cit. xv., p. 354 (Quetta: common in winter); Fulton, op. cit. xvi., p. 64 (Chitral: common on migration); Cumming, t. c., p. 697 (Seistan: abundant and apparently resident); Ward, op. cit. xvii., p. 948 (Kashmir: occurs in June and July in the Valley, but no eggs found).

Quite our commonest Duck and the first to arrive. The 9th of September is the earliest date on which I have noted it. As with all Ducks in Kohat, it is much more numerous in autumn and spring than in winter. It leaves towards the end of April.

[1599.] MARECA PENELOPE. The Wigeon.

Fulton, J. B. N. H. S. xii., p. 64 (passes through Chitral); Cumming, op. cit. xvi., p. 698 (Seistan: winter visitor); Ward, op. cit. xvii., p. 948 (fairly common in winter in Kashmir).

Not common, but usually occurs in March and April.

[1600.] DAFILA ACUTA. The Pintail.

Rattray, J. B. N. H. S. xii., p. 348 (Thall: one flock seen in March); Marshall, op. cit. xv., p. 354 (Quetta: fairly common in winter); Fulton, op. cit. xvi., p. 64 (Chitral: passes through in February and March); Cumming, t. c., p. 698 (Seistan: a winter visitor); Ward, op. cit. xvii., p. 948 (common on passage in Kashmir).

Passes through in small numbers in February and March.

[1601.] QUERQUEDULA CIRCIA. The Garganey.

Ward, J. B. N. H. S. xvii., p. 948 (Kashmir: common on passage).

Mr. Donald shot one of a pair (a male) on the grass-farm in October; this is the only occurrence of the Garganey in the District that I have heard of.

[1602.] SPATULA CLYPEATA. The Shoveller Duck.

Rattray, J. B. N. H. S. xii., p. 348 (Thall: common in spring); Marshall,

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op. cit. xv., p. 354 (Quetta: fairly common in winter); Fulton, op. cit. xvi., p. 64 (Chitral: passes through in March and April); Cumming, t. c., p. 698 (Seistan: common in winter and probably resident); Ward, op. cit. xvii., p. 948 (Kashmir).

Not common in autumn and winter; but large numbers pass through in spring. Some individuals stay very late, and I have noticed them all through April and up to the 20th of May.

[1604.] NETTA RUFINA. The Red-crested Pochard.

Rattray, J. B. N. H. S. xii., p. 348 (Thall: occurs in March); Marshall, op. cit. xv., p. 354 (Quetta: common in winter); Cumming, op. cit. xvi., p. 698 (Seistan: common in winter, probably resident); Ward, op. cit. xvii., p. 948 (Kashmir: common in February).

Not common, but found throughout the winter at Dhand Tank, and occasionally elsewhere, up till the end of March.

[1605.] NYROCA FERINA. The Pochard.

Marshall, J. B. N. H. S. xv., p. 354 (Quetta: common in winter); Cumming, op. cit. xvi., p. 698 (Seistan: common and doubtless resident); Ward, op. cit. xvii., p. 948 (Kashmir).

Next to the Teal this is our commonest Duck in the cold weather.

[1606.] NYROCA FERRUGINEA. The White-eyed or Ferruginous Duck.

Marshall, J. B. N. H. S. xv., p. 354 (Quetta: common in February). Cumming, op. cit. xvi. p. 698 (Seistan: common in winter); Ward, op. cit. xvii., p. 948 (Kashmir: a common resident).

Less common than the last species, but fairly numerous on Dhand Tank in the winter. It leaves towards the end of March.

[1609.] NYROCA FULIGULA. The Tufted Pochard.

Marshall, J. B. N. H. S. xv., p. 354 (Quetta: common in March); Cumming, op. cit. xvi., p. 698 (a winter visitor in Seistan); Ward, op. cit. xvii., p. 948 (common, especially in March).

I have only met with this Duck at Dhand, where it is abundant and occurs throughout the winter, at least up till the end of March.

[1611.] ERISMATURA LEUCOCEPHALA. The White-headed Duck.

Marshall, J. B. N. H. S. xv., p. 354 (Quetta: February); Cumming, op. cit. xvi., p. 699 (Seistan: very common in winter, perhaps resident); Ward, op. cit. xvii., p. 949 (not common, but a regular winter visitor in Kashmir).

Very rare. I observed single birds at Dhand on the 18th of November, 1906, and the 21st of February, 1907, but could not get a shot; it is, however, an unmistakeable species. Capt. MacNab, I.M.S., shot one at Mardan (thirty miles north of our limits) on the 12th of November, 1899 (*vide* J. B. N. H. S. xiii., p. 182).

[1612.] MERGUS ALBELLUS. The Smew.

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Rattray, J. B. N. H. S. xii., p. 348 (Thall: February); Marshall, op. cit. xv., p. 354 (Quetta: common in winter); Ward, op. cit. xvii., 949 (Kashmir: often seen on the Wular Lake; breeds on the Shyoh).

An immature bird was brought in to Major Magrath on the 26th of December, 1905. I also observed a big flock on the Indus on the 18th of February, 1907.

[1613.] MERGANSER CASTOR. The Goosander.

Ward, J. B. N. H. S. xviii., p. 949 (shot on the Wular Lake and seen on the Indus).

A rare winter visitor, occurring on the Indus, where Mr. Donald has shot it.

[1616.] PODICIPES NIGRICOLLIS. The Eared Grebe.

403 & 404. Dhand, 1,200 feet, 17th November.

Occurs regularly every winter on Dhand Tank, staying at least up till the end of March.

[1617.] PODICIPES ALBIPENNIS. The Indian Little Grebe.

Marshall, J. B. N. H. S. xv., p. 354 (Quetta: common in spring); Cumming, op. cit. xvi., p. 699 (Seistan: resident); Ward, op. cit. xvii., p. 949 (resident in Kashmir).

A very common resident at Dhand, and in one or two other suitable localities.

The following species *not* in the Kohat list were noted by me last March on the River Indus near Kalabagh *(a few miles south of our limits)*, and are of interest as they probably also occur in Kohat:—

[867.] ALAUDULA ADAMSI. The Indus Sand-Lark was common along the sandy shore wherever there were patches of vegetation; it had then paired, and one pair allowed me to watch them building their nest under the lee of some tamarisk shoots.

[1189.] PANDION HALIAËTUS. I saw one Osprey fishing.

[1419.] ESACUS RECURVIROSTRIS. I put up four Great Stone-Plovers off a stony bank.

[1503.] STERNA SEENA. The Indian River-Tern, the Black-bellied, and the Caspian were all common, especially the first two.

[1517.] RHYNCHOPS ALBICOLLIS. A flock of about thirty Scissorbills was seen flying up and down the river, occasionally resting on a sand-bank Cry, a nasal *kap, kap*.

[1583.] ANSER INDICUS. I saw a flock of Bar-headed Geese cropping young beans.

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THE PALMS OF BRITISH INDIA AND CEYLON, INDIGENOUS AND INTRODUCED

BY

E. BLATTER, S.J.

PART IV.

(With Plates XII, XIII, XIV, XV, XVI & XVII.)

(Continued from page 705 of this Volume.)

TRACHICARPUS TAKIL, Becc. Webbia I, 52.—Chamærops martiana (non-Wallich) Duthie in Gard. Chronicle 1886, 10th April, p. 457.—Royle, Illustr. of the Bot. of Himal. Mount., pp. 394, 397, 399 (*ex parte?*)—Hook f. Himal. Journ. II, 280 (*quod ad plant. ex Himal. occid. pertinet*).

NAMES.—Takil, Jhangra, Jhaggar, Tal (in Kumaon).

Stem of young plants growing oblique, then ascending, erect, straight and stout, distinctly conical when young (in a young specimen, 12½ feet high, the stem measured 3½ feet in circumference at the base and only 1 foot at the top); when fully developed 30-40 feet high, produces flowers when about 3⅓ feet high, always covered with the permanent leaves and the chestnut-brown fibrous network; the ligular appendages of the sheath erect, similar to those of *T. excelsa*, but much shorter, broad, triangular, remaining erect in the terminal bud. Leaves all permanent, similar to those of *T. excelsa*, but those of the previous year just below the last flowering spadices reflexed, but permanent. Petiole about as long as the limb, slender, subtrigonous, the lower angle rounded; margins very acute, armed with minute irregular subspinescent teeth or crenulations; ligule at the top of the petiole semilunar, irregular, crenate in the upper part. Blade ¾ orbicular, 3⅓-4 feet in diameter, with 45-50 divisions measuring 2⅓-2⅚ feet from the top of the petiole to the apex of the median segments. Segments very irregularly divided, more or less down to the middle, green, rather shining on the upper surface, glaucescent pruinose on the lower; central segments about 1⅕ inch broad from the base to almost the top, where they

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are shortly bifid or bidentate with the teeth obtuse and divaricate; lateral segments gradually becoming more narrow and shorter.

Male spadices very similar to those of *T. excelsa* as regards size, ramification and shape of the spathes, but the branchlets are less densely covered with flowers. Flowers glomerulate, 2-4 together with minute yellow fleshy bracts at the base, in the well developed bud obscurely trigonous-globose, $\frac{1}{6}$ inch long; calyx very small, sepals suborbicular, very obtuse and rounded at the apex; petals broadly ovate, concave, obtuse, twice as long as the calyx; stamens 6, equal uniseriate; filaments cylindrical—lesiniform, at least $\frac{1}{4}$ longer than the petals; anthers ovate-oblong, versatile; carpels 3, narrowly conical, slightly incurved and divergent, glabrous, half as long as the petals, with an ovule apparently well developed. Female spadix and flowers not yet described. Fruit similar to that of *T. excelsa*, but more distinctly reniform and somewhat broader. (After Beccari.)

HABITAT.—Up to now this palm has been found in the Western Himalaya only. It grows on Mount Takil in Kumaon at a height of 6,600—8,000 feet, where it is annually covered with snow. According to Gamble it prefers the cool narrow valleys to the north-west. Duthie found hundreds of them at a height of 8,000 feet in the moist forests of *Quercus dilatata*.

CULTIVATION IN EUROPE.—Beccari is probably the first to introduce this palm in Europe. He obtained some plants from seeds in the year 1887. All the young plants showed a marked tendency towards unilateral development, as if they wanted to creep on the ground. In the course of time the stem grew upwards and became quite straight, but the lower part always remained much thicker than the upper portion. After the appearance of the stem this palm seems to grow quicker than *T. excelsa*. The trees are kept in the open in the vicinity of Florence and they did not suffer even during the severest of winters. Only once in an exceptionally cold winter the ice spoilt a few leaves. The heat seems to be more harmful to them than the cold. In 1904 some leaves were so to say burnt by the July sun and, perhaps, also in consequence of the exceedingly dry air.

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In April 1902 one of the palms produced 3 male spadices. The same tree measured in November 1904 almost 13 feet, taken from the ground to the top of the central leaves.

ERRATA.—On page 703 of the previous Number it was stated under the heading *Habitat* that *Trachycarpus martiana* was found in Kumaon; this appears to be a mistake as this species does not seem to occur in Kumaon.

RHAPIS, L. f. in Ait. Hort. Kew., III, 473.

(From the Greek "Rhapis": a rod.)

Jacq. Hort. Schœnbr. t. 316.—Mart. Hist. Nat. Palm. III, 253, t. 144.—Kunth, Enum. Pl. III, 251.—Walp. Ann. III, 471.—Bot. Mag. t. 1371.—Miq. Fl. Ind. Bot. III, 61.—Benth. and Hook. Gen. Pl. III, II. 930, 99.

Stem low, cane-like, cæspitose, covered with the remains of the petioles. Leaves alternate, terminal, small, with the segments divided almost to the base; margins of segments denticulate. Spadix long-peduncled; peduncle with 2-3 short, tubular spathes. Flowers dioecious or polygamous on the slender branches of the paniculately branched spadix, yellowish. Calyx cupular, 3-dentate. Corolla in male flowers club-shaped, in female flowers shorter, obovate. Stamens 6, rudimentary in the female flowers. Carpels 3, fleshy, ending in short styles. Berry small, 1-seeded; pericarp fleshy; endocarp soft; seed compressed-globose; embryo ventral.

Species at least 9[1].—Eastern Asia, from China to the Sunda Islands.

CULTIVATION IN EUROPE.—Densely tufted green house palms. The species are of a very easy culture. They thrive in a compost of rich, strong loam to which is added a small portion of vegetable mould and sand; they require perfect drainage and plenty of water throughout the summer. Propagation may be effected by suckers.

RHAPIS FLABELLIFORMIS, Ait., Hort. Kew. ed. I., III, 473.—Mart. Hist. Nat. Palm. III., 253, t. 144.—Kunth, En. Pl. III, 251.—Jacq. Hort. Schœnbr. t. 316.—Bot. Mag. t. 1371.—Franch. et Savat. En. Pl. Jap. II, 2.—Benth. Fl. Hongk. 340.—Bretschn. Hist. Europ. Bot. Disc. 126. —*R. kwanwortsik*, H. Wendl., Ind. Palm. 34.—Seem. Bot. Voy. Herald, 416.

[1] O. Beccari has lately described some new species of *Rhapis*. Cf. Webbia, vol. 3, Firenze, 1910.

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NAME.—Dwarf Ground-Rattan.

DESCRIPTION.—Stem about 5-6 feet high, of the thickness of the thumb, sheathed by the reticulate persistent bases of the leaves. Leaves about 8, petioled, palmate, 5-7-parted; segments sub-plicate, ciliate-spinulous along the edges and keel of the plaits, indented-erose at the end; petiole round-ancipital, naked, very obscurely denticulate. Spadix sparse, paniculately branched, 4-5 inches long; spikelets thick-set with sessile yellowish flowers.

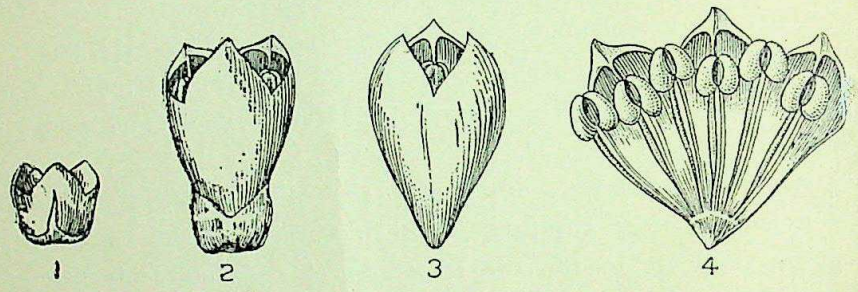

FIG. 9.

Rhapis flabelliformis.

1. Calyx of male flower with bract.
2. Male flower.
3. Corolla of male flower.
4. Open Corolla of male flower with stamens

All magnified. (After Martius).

Male flowers: calyx of one piece, urceolate, fleshy, green, smooth, scarcely 1 line in length, trifid, segments roundish-pointed, upright, with a membraneous border; corolla yellow, coriaceous-fleshy,

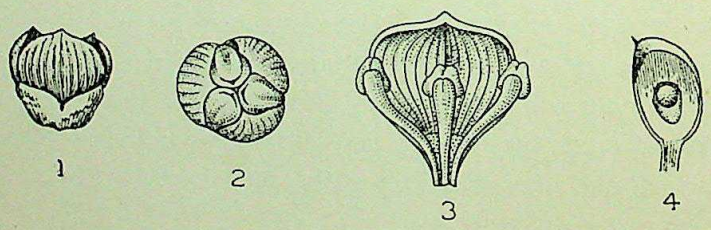

FIG. 10.

Rhapis flabelliformis.

1. Side view of female flower.
2. Female flower seen from above.
3. Part of Corolla of female flower with 3 staminodes.
4. Longitudinal section through ovary.

All magnified. (After Martius).

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obovate-oblong, tube clavate, triquetral, twice the length of the calyx, limb trifid; three times shorter than the tube, segment ovate, acute, subconnivent; filaments 6, filiform-triquetral, shorter than the corolla, adnate to the tube, alternately somewhat thicker and more detached. Fig. 9 and 10.

HABITAT.—S. China and Loochoo, in the Happy Valley Woods.

USES.—This palm yields excellent walking-sticks, called "ground-rattans."

CULTIVATION IN EUROPE.—The Dwarf Ground-Rattan is adapted to room-cultivation and may be kept at a great distance from the window. Of this species there exist varieties with white and golden-yellow leaves.

ILLUSTRATION.—Plate XIII A shows a characteristic group of Dwarf Ground-Rattans as grown in the Royal Botanic Gardens of Peradeniya in Ceylon. Mr. H. F. Macmillan has been kind enough to take the photograph himself.

RHAPIS HUMILIS, Blme. Rumphia, II, 54.—Mart. Hist. Nat. Palm. III, 254.—Walp. Ann. V, 818.—Wright J. Linn. Soc. vol. 36, p. 169. *R. sierotsik*, Sieb.—*Chamærops excelsa*, var. *humilior*, Thbg. Fl. Jap. 130.

NAME.—Low Ground-Rattan.

DESCRIPTION.—Leaves cut into from 7-10 spreading segments; petioles unarmed. Similar in general aspect to *R. flabelliformis*.

HABITAT.—China (cultivated in Japan).

CULTIVATION IN EUROPE.—The Low Ground-Rattan is well adapted to room-cultivation. There exist beautiful garden-varieties with white and golden yellow leaves.

ILLUSTRATION.—The photograph on Plate XII A, taken by the Rev. M. Maier, S.J., shows several specimens of the Low Ground-Rattan growing in the Victoria Gardens of Bombay. The position of the leaves and the greater number of leaf-segments at once distinguish this species from the Dwarf Ground-Rattan on Plate XIII A. The plants are about 5 feet high.

COCCOTHRINAX, Sargent, Bot. Gazette, XXVII, 87, (1899). (The name was given in allusion to the berry-like fruit.)

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Thrinax, Endlicher, Gen. Pl. 253 (in part) 1836.—Meissner, Gen. 357 (in part).—Benth. and Hook., Gen. III, 930.—Drude, Engl. and Prantl. Pflanzenf. II, pt. III, 34 (sect. *Euthrinax*).—Baillon, Hist. Pl. XIII, 317 (excl. sect. *Hemithrinax*).—Sargent, Silva N. Ann. X. 49. (sect. *Euthrinax*).

Small unarmed trees, with simple or clustered stems or rarely stemless. Leaves orbicular, or truncate at the base, pale or silvery white on the lower surface, divided into narrow obliquely-folded segments acuminate and divided at the apex; rhachises narrow; ligules thin, free, erect, concave, pointed at the apex; petioles compressed, slightly rounded and ridged above and below, thin and smooth on the margins, gradually enlarged below, into elongated sheaths of coarse fibres forming an open network covered while young by thick hoary tomentum. Spadix interfoliar, paniculate, shorter than the leaf-stalks, its primary branches furnished with numerous short slender pendulous flower-bearing secondary branches; spathes numerous, papery, cleft at the apex. Flowers solitary, perfect, jointed on elongated slender pedicels; perianth cup-shaped, obscurely lobed; stamens 9-12, inserted on the base of the perianth, with subulate filaments enlarged and barely united at the base, and oblong anthers; ovary 1-celled, narrowed into a slender style, crowned by a funnel-formed oblique stigma; ovule basilar, erect. Fruit a subglobose berry raised on the thickened torus of the flower, with thick juicy black flesh. Seed free, erect, depressed-globose, with a thick hard vertically-grooved shell deeply infolded in the bony albumen; hilum basilar, minute: raphe hidden in the folds of the seed-coat; embryo lateral or apical.

Species about 15.

DISTRIBUTION.—*Coccothrinax* is confined to the tropics of the New World. Two species, of which one is stemless, inhabit southern Florida, and at least eleven other species are scattered over several of the West Indian Islands.

CULTIVATION IN EUROPE.—All the species of this and the next genus are stove-palms. When young they should be kept in a compost of loam, peat and sand; as they get older, turfy loam and sand is preferable. Propagation is effected by seeds. These

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should be obtained when freshly imported, sown in well-drained pots or pans of sandy loam, and plunged in bottom heat.

COCCOTHRINAX ARGENTEA, Sargent in Bot. Gaz. XXVII (1899), 89.—Beccari, Webbia, II (1907), 317.—*Thrinax argentea*, Lodd. in Desf. Cat. ed. 3, 31; Roem. et Schult, Syst, Veg. VII, 1300.—Mart. Hist. Nat. Palm., III, 256, t. 103, III.—*Th. multiflora*, Mart. Hist. Nat. Palm. III, 255, t. 103, I, a.—*Th. excelsa*, Hart., Bot. Mag. t. 7088?

NAMES.—Silver Thatch Palm, Silver-leaved Palmetto, Guano.

DESCRIPTION.—Stem reaching up to 40 feet high. Leaves peltate radiate, suborbicular, green above, whitish or almost silvery below, in adult plants divided into about 60 segments down to a little below the middle, in young plants much deeper. Petiole very long and slender, depressed-biconvex with very acute margins; ligule glabrous, subligneous, broadly subcordale, prolonged in the centre into a triangular acuminate point; larger segments of adult plant up to $3\frac{1}{3}$ feet long and $1\frac{1}{5}$—$1\frac{2}{5}$ inch broad at the point where the segments divide, then narrowing into a very acuminate point which is shortly split at the apex; lateral segments gradually becoming narrower, longer acuminate and more deeply divided. Spadix shorter than the leaf, with a few partial inflorescenes; primary spathes papery, reddish brown or cinnamon-coloured, delicately striate, more or less acuminate at the apex, on the ventral side of the upper part open, with the margins entire or slightly filamentous fibrous; partial inflorescences forming panicles which are broadly ovate, 6-8 inches long with many flowering branchlets inserted irregularly on the principal axis; flowering branchlets filiform, about $\frac{1}{24}$ inch thick, the lowest ones $3\frac{1}{3}$—4 inches long, the upper ones a little shorter, with numerous flowers spirally arranged and borne on pedicels $\frac{1}{24}$—$\frac{1}{6}$ inch long. Perianth low-cupular, divided almost to the base into 6 narrow subulate teeth; stamens usually 9, anthers linear, $\frac{1}{12}$ inch long, spirally contorted, obtuse at the apex; ovary ovate-globose, very abruptly constricted into a short neck which widens into a large infundibuliform stigma.

Fruiting perianth disc shaped, depressed. Ripe fruit $\frac{3}{8}$-$\frac{5}{12}$ inches in diameter, spherical, black-violascent; pericarp fleshy. Seed $\frac{1}{4}$-$\frac{7}{24}$ and even $\frac{1}{3}$ inch in diameter, cerebriform. Embryo exactly apical.

HABITAT.—San Domingo.

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NOTE.—It is good to remember that the specific name "argentea" has been applied, not only in gardens and hothouses, but also by many authors, to all the species of *Thrinax* and *Coccothrinax* which show a silvery white on the underside of their leaves.

ILLUSTRATION.—Plate XIII B shows a well grown specimen of the Silver Thatch Palm (under the synonymous name of *Thrinax argentea*) in the Royal Botanic Gardens of Peradeniya in Ceylon. The stem is about 12 feet high. We owe the photograph to the kindness of Mr. H. F. Macmillan.

THRINAX sw., Prodr., 57 (1788).

(From the Greek 'Thrinax,' a fan, alluding to the form of the leaves).

Schreber, Gen. 772.—Mart. Hist. Nat. Palm, III, 254, 320, t. 103, 163.—Endlicher, Gen. 253.—Meisner, Gen. 357.—Drude, Engl. and Prantl. Pflanzenf. II, pt. III, 34. (sect. *Porothrinax*).—Sargent, Silva N. Am. X. 49. (sect. *Porothrinax*); Bot. Gaz. XXVII, 83. Becc. Webbia, II, 247.

Small unarmed trees, with stems covered with pale-grey rind. Leaves orbicular, or truncate at the base, thick and firm, usually silvery white on the lower surface, divided to below the middle into narrow acuminate parted segments with thickened margins and midribs; rachises narrow borders, with thin usually undulating margins; ligules thick, concave, pointed, lined while young with hoary tomentum; petioles compressed, rounded above and below, thin and smooth on the margins, with large clasping bright mahogany-red sheaths of slender matted fibres covered with thick hoary tomentum. Spadix interfoliar, stalked, its primary branches short, alternate, flattened, incurved, with numerous slender rounded flower-bearing branchlets; spathes numerous, tubular, coriaceous, cleft and more or less tomentose at the apex. Flowers solitary, perfect; perianth 6-lobed; stamens six inserted on the base of the perianth, with subulate filaments thickened and only slightly united at the base, or nearly triangular and united into a cup adnate to the perianth, and oblong anthers; ovary 1-celled, gradually narrowed into a stout columnar style crowned by a large funnel-formed flat or oblique stigma; ovule basilar

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erect. Fruit a globose drupe with juicy bitter flesh easily separable from the thin-shelled tawny brown nut. Seed free, erect, slightly flattened at the ends, with an oblong pale conspicuous subbasilar hilum, a short-branched raphe, a thin coat, and uniform albumen more or less deeply penetrated by a broad basal cavity; embryo lateral.

SPECIES.—At least ten are now generally recognized.

DISTRIBUTION.—*Thrinax* is confined to the tropics of the New World and is distributed from Southern Florida through the West Indies to the shores of Central America.

NOTE.—Several beautiful and ornamental species of this genus are cultivated in European hot-houses and Indian gardens; but with regard to their names mentioned in books, herbaria and tickets of living specimens it is difficult to imagine a greater confusion. Though the number of species is not great, Beccari does not hesitate to say that "a critical revision of the literature on *Thrinax* would be a bold, if not an impossible undertaking." "There are, besides," he continues, "numerous horticultural species which are only known by name or which have been described from the leaves of young specimens and which cannot be recognized anymore."

If an authority like Beccari speaks in these terms, nobody will expect us to identify all the different species which, at present, are growing in Indian gardens, sometimes without name, sometimes with names not to be found in any book, and very often with wrong names.

The only way of clearing up the many doubts and uncertainties and to arrive at a correct nomenclature will be to describe accurately and with every possible detail the morphological structure of flowering and fruiting specimens, to preserve leaves, flowers and fruits, and wherever practicable, to take good photographs of young and adult plants.

We reproduce in our series the photographs of two evidently different species, without adding the description, because we have not seen the flowers of those plants.

Plate XII-B shows a palm which is known in Indian gardens under the name of *Thrinax radiata*, Lodd. The photograph was taken by Rev. M. Maier in the Victoria Gardens of Bombay.

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Very incomplete descriptions of *Thrinax radiata* are to be found in the following books: Roem. et Schult., Syst., Veg. VII, 2, 1301; Desf. Cat. h. Paris ed. 3, 31; Mart. Hist. Nat. Palm, III, 257; but they will not help much towards establishing the identity of our specimen.

We hope the Superintendent of the Victoria Gardens will be kind enough to furnish us, after some time, with a detailed description of the flowers.

Plate XIV represents a beautiful specimen of the High Thatch Palm, which is called in Indian gardens *Thrinax excelsa*, Griseb. (or Lodd. et Griseb.). Mr. Phipson has taken the photograph in a Bombay garden. This palm is a favourite with amateurs on account of its ornamental character.

There are many palms which received the name of *Thrinax excelsa* in the course of time. One of them is described and figured in Hooker's Botanical Magazine (t. 7088); but even so Beccari was not able to establish its exact identity.

THRINAX PARVIFLORA, Sw. Prodr. 57 (1788); Fl. Ind. Occid. I, 614, t. 13—Ait. Hort. Kew. III, 473—Willd., Spec. Pl. II, pt. I, 202.—Pers. Syn. I, 383.—Lunan, Hort. Jam. II, 28.—Poiret, Lam. Dict. VII, 635.—Titford, Hort. Bot. Am. 112.—Spreng. Syst. Veg. II, 20.—Roem. & Sch. Syst. Veg. VII, pt. II, 1300.—Mart. Hist. Nat. Palm, III, 255, t. 103.—Kth. Enum. Pl. III, 253.—Dietrich, Syn. II, 1091.—Walp. Ann. V, 818.—Grisebach, Fl. Brit. W. Ind. 515.—*T. pumilo*, Lodd. ex Roem et Sch., Syst., Veg. VII, 2, 1301.—*T. excelsa* (Lodd.?) Griseb. Fl. Brit. W. Ind. 515.

NAMES.—Silk-Top Palmetto; Thatch Palm; Palmetto Royal; Palmetto Thatch.

DESCRIPTION.—A tree, from 10-20 feet in height, with a slender stem 4 or 5 inches in diameter, covered with thin smooth blue-grey rind. The leaves are orbicular, from 3-4 feet in diameter, thin, bright green on the upper surface, paler and coated while young on the lower surface with pale caducous tomentum, and, except at the base, where they are split nearly to the ligula, divided for about two-thirds of their diameter into laciniate lobes, with stout yellow midribs prominent on the upper side, and with much thickened reflexed margins; the lobes near the middle of the leaf

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are 1-1¼ inch broad, diminishing in width towards the base of the leaf, where they are not more than ¼ inch wide. Rhachis of leaf reduced to a thin truncate undulate border, and the ligula is crescent-shaped, about ⅛ inch long, ¼ inch thick, and 1 inch wide, and is furnished near the middle with a flat nearly triangular point ½ inch long, petiole thin and flexible, ¾ inch wide at the base of the blade, rounded and ridged on the upper and lower sides, about as long as the blade of the leaf, and enlarged below into the elongated sheath, which is coated while young with a thick felt-like hoary tomentum. Three or four panicles of flowers, from 2-5 feet in length, usually appear each year; secondary branches much flattened, recurved, and 4-6 inches in length, the slender flower-bearing branchlets being from 1½-8 inches long, and in the axils of ovate acute scarious brownish bracts about ¼ inch long and ⅛ inch wide; spathes coriaceous, pubescent above the middle, and often ciliate on the margins at the apex. Flowers raised on rigid spreading pedicels ⅛ inch in length; perianth cup-like, 6-lobed; stamens usually 6, with slender exserted filaments slightly united below and large oblong light yellow anthers; ovary subglobose, dark orange-coloured, surmounted by an elongated style dilated into a broad oblique stigma (Fig. 11). Fruit dark chestnut-brown or nearly black, rather less than ⅓ inch in diameter, with a thin somewhat fleshy outer coat closely

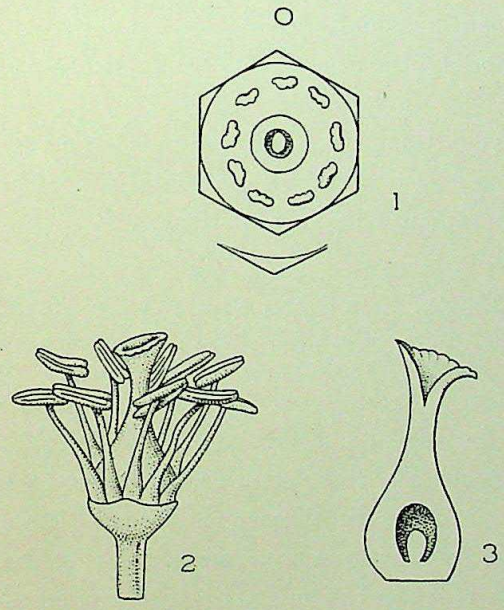

FIG. 11.

Thrinax parviflora.

1. Diagram of flower. 2. A flower (enlarged).
3. Longitudinal section of pistil (enlarged).
(After Sargent.)

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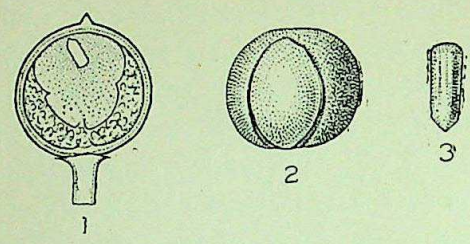

FIG. 12.
Thrinax parviflora.
1. Vertical section of fruit.
2. A seed (enlarged).
3. An embryo (much magnified).
(After Sargent).

investing the rather thicker crustaceous light brown inner coat, and a deeply furrowed depressed globose tawny brown seed $\frac{1}{4}$ inch in diameter, with ruminate albumen. (Fig. 12).

HABITAT.—Up to now the Thatch Palm has been found in Jamaica only. A *Thrinax* from Florida, which was formerly included in this species, is now known under the name *Thrinax floridana*, Sargent.

USES.—The wood of the Silk-Top Palmetto is light, soft, and pale brown, with a hard outer rim about $\frac{1}{8}$ inch in thickness, and contains numerous hard inconspicuous fibro-vascular bundles. The specific gravity of the absolutely dry wood is 0·5991, a cubic foot weighing 37·34 pounds.

ILLUSTRATION.—Major A. T. Gage has kindly supplied me with a photograph of *Thrinax parviflora* as shown on Plate XV. The specimen is growing in the Calcutta Botanic Gardens.

THRINAX BARBADENSIS, Lodd., in Mart. Hist. Nat. Palm, III, 257.—Griseb. Fl. West. Ind. Isl. 515.—Duss, Guadel. et Martinique, in Ann. Instit. Col. de Marseille, vol. III, 1896.—*T. parviflora*, Maycock, Fl. Barbad, 146.—*Copernicia barbadensis*, Hort.

NAMES.—Thrinax de la Barbade, Latanier, Palmier à balai.

DESCRIPTION.—A very ornamental tree; stem up to 50 feet high and more, cylindric, 5-7 inches in diameter. Leaves large, flabelliform, palmatifid, glabrous; segments numerous, lanceolate, acumimate; ligule obsolete, truncate; petiole not armed, compressed-convex on both sides, about as long as the leaf-blade, covered at the base with a fibrous network. Spadix large, 10-20 inches long, consisting of about 4-10 partial panicles on a common axis, glabrous; each partial panicle enclosed in a membranous sheath which is closed up to the middle, upper part acuminate, concave.

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Flowers hermaphrodite, whitish, with a strong disagreeable odour which attracts a great number of bees; pedicel short, a little longer than the stamens; stamens 8-12, hypogynous; filaments subulate, thickened, compressed and united at the base, slightly shorter than the ovary; anthers erect, bilocular, basifixed, bifid at both ends; style slightly shorter than the ovary, stout, funnel-shaped at the top; ovary 1-celled, 1-ovuled. Fruit globose, of the size of a pea or small cherry, pulpy, flesh black, containing a reddish-black juice.

HABITAT.—Barbadoes; Guadeloupe, on limestone hills.

FLOWERS.—Twice a year and often five times in two years. (Duss).

USES.—When young the palm is well adapted for room-decoration.

Note: Beccari has changed the old name of this species into *Coccothrinax barbadensis*. Cf. Webbia, II, 328.

CORYPHA, L. Gen. Nat. 1221.

(From the Greek "Corypha," crown of the head, vertex. The palm is called so on account of its beautiful crown of leaves.)

Gaertn., Fruct., I.,t.7.—Lam. Illustr., t. 899.—Bl., Rumph. II. 57, t. 97, 98, 105.—Roxb. Corom. Pl. t. 255, 256.—Kunth Enum. Pl. III, 235.—Mart. Hist. Nat. Palm. III, 231, 318, t. 108, 127. —Griff. Palms Brit. Ind. t. 220 D, E, F, append. 23.—Miq. Fl. Ind. Bat. III, 49.—Kurz For. Fl. II, 524.—Benth. et Hook. Gen. Pl. III, II, 922, 84.

Tall, stout, unarmed palms, dying after once flowering and ripening their seed at the age of between 20 and 80 years. Leaves very large, orbicular or lunate, flabellately multifid; segments in duplicate in vernation; petioles stout, concave, spinous at the edges. Spadix a very large, terminal, erect, decompound panicle. Spathes many, tubular. Flowers small, hermaphrodite; calyx cupular, 3-fid; petals 3, connate below in a stipes, ovate, acute, imbricate or subvalvate; stamens 6; filaments subulate; anthers dorsifixed. Ovary 3-lobed, 3-celled; style short, subulate;

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stigma minute. Fruit of 1-3 fleshy, globose drupes; styles basilar; seeds erect, globose or oblong; albumen uniform; embryo spiral.

Species about 6; Tropical Asia.

CULTIVATION IN EUROPE.—The species of this genus are stove-plants. They are of somewhat slow growth and thrive best in a compost of two parts of loam, one of peat, and one of sand. Perfect drainage and much water are essential to success.

CORYPHA ELATA, Roxb., Fl. Ind. II. 176; Mart. Hist. Nat. Palm. 233; Kunth Enum. III, 236; Griff. in Calc. Journ. Nat. Hist. V, 314; Palms Brit. Ind. 112, t. 220, D.—Hooker, Fl. Brit. Ind. VI, 428; Brandis Ind. Trees, 658.

NAME.—Bajur (Beng.).

DESCRIPTION.—Trunk straight, often varying in thickness, 60-70 feet high by about 2 feet in diameter, strongly marked with rough, dark coloured, spiral ridges and furrows. Leaves round the top of the tree, immediately under the base of the inflorescence, numerous, lunate, palmate-pinnatifid, plaited, 8-10 feet in diameter; segments generally from 40-50 pairs, united about half their length, ensiform, apices rather obtuse and bifid, texture hard, smooth on both sides. When the tree begins to flower, the leaves wither and fall off, leaving the fructiferous part naked; petioles 6-12 feet long, spirally arranged, auricled, concave above, with the thin, hard, black margins thereof cut into numerous very short, curved spines, spadix about $\frac{1}{5}$ to $\frac{1}{4}$ the height of the trunk, much narrower in span than the foliage, supradecompound; the various and innumerable ramifications are always alternate, smooth, and of a pale yellow colour. Spathes numerous, one at each joint of the various ramifications of the spadix, smooth and when young, of a pale yellowish-green. Flowers small, sessile, collected in little fascicles over the ultimate divisions of the panicle, pale yellow, rather offensive. Calyx small, 3-toothed; petals 3, oblong, reflexed, shorter than the stamens; filaments 6, broad at the base, and there united, towards the apex slender and incurved; anthers ovate, dorsifixed. Ovary superior, round-ovate, suddenly contracted into the short style, 3-lobed, 3-celled, with 1 ovule in each cell, attached to the bottom of the cell; style short, 3-grooved;

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stigma 3-lobed. Drupe about 1 inch in diameter, stipitate, olive-coloured, smooth when fresh, but soon becoming dry and wrinkled, 1-celled; the two abortive lobes of the ovary are always to be found at the base; pericarp friable; endocarp adnate to the testa; seed solitary, subglobular; perisperm equable, hard, horny, pale grey; embryo simple, short, apical.

HABITAT.—Bengal and Burma.

FLOWERS.—In March and April; fruit ripens after about 12 months.

ILLUSTRATIONS.—The photograph reproduced on Plate XVI was kindly supplied by Major Gage and represents a fully developed specimen of *Corypha elata*. The spiral furrows on the stem at once distinguish this species from *Corypha umbraculifera* and *Corypha talliera*.

To the left of the Bajur is a young specimen of *Phœnix sylvestris* and to the right the huge crown of a young *Corypha umbraculifera*.

The photograph has been taken in the Calcutta Botanic Gardens.

We reproduce on Plate XVII a photograph of the Talipot avenue in the Royal Botanic Gardens of Peradeniya. It is one of the most striking features of the garden, its shades of colour in green and gold affording delight to the artistic eye. This species (*Corypha umbraculifera*) will be described in the next number of the Journal. The photograph has been taken by Messrs. Pláté & Co.

(To be continued.)

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A NEW MURINE GENUS AND SPECIES FROM SIND, WITH DIAGNOSES OF THREE OTHER NEW GENERA BASED ON PREVIOUSLY KNOWN SPECIES OF "MUS."

BY

OLDFIELD THOMAS, F. R. S., BRITISH MUSEUM.

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I owe to the kindness of Mr. R. C. Wroughton the opportunity of examining and describing a highly interesting mouse obtained in Sind by Mr. E. Priestley for the Natural History Society of Bombay, and now presented by the Society to the British Museum.

Mr. Wroughton has himself given a note on the other species obtained by Mr. Priestley, among which is a *Leggada* so like the new species as to be readily mistaken for it.

PYROMYS, g.n.

External proportions about as in *Leggada platythrix*. Fur profusely mixed with spines, but not, as in *Acomys*, wholly spinous. Ears rather small. Thumb with a small triangular nail, other digits with normal sized claws; soles naked, smooth; pads six in number, large, rounded, the last one not elongated. Fifth hind toe long, reaching nearly to end of the first phalanx of the fourth. Mammæ 4—2= 12.

Skull strongly bowed, its profile convex above. Supra-orbital ridges broad and strongly developed, but disappearing posteriorly half way across the parietals, the interorbital space narrow anteriorly, rapidly broadened posteriorly. Anterior palatine foramina very long, extending to level of the anterior internal root of m^1; posterior palatine foramina also long, extending from the level of the hinder cusp of m^1 to the front cusp of m^3. Posterior palate continued backward some way behind m^3, the narial opening narrowed, and the middle part of the palatal edge thickened into a median palatal spine. Bullæ unusually large.

Incisors normal, their edge not notched. Molars of the same

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general type as in *Acomys*, not hypsodont as in the more typical *Epimys*, and m^1 not disproportionally large as in *Mus* and *Leggada*. But their pattern is more zigzagged, so as to look more complicated, though the size, number and position of the cusps is the same. Antero-internal cusp of m^2 very large, antero-external very small. M^3 well developed, with three distinct cusps on its inner edge.

Type.—*Pyromys priestleyi*, sp. n.

The most striking point about this genus is its unique mammary formula, no other known Murine having four pectoral pairs.

PYROMYS PRIESTLEYI, sp. n.

General external appearance almost exactly as in *Leggada platythrix sadhu*, brought from the same locality. Fur thickly mixed with spines, those of back about 6 mm. in length. General colour above, uniform pale grey ("drab-grey") without any buffy suffusion. Under surface white, the hairs and spines white to their roots; line of demarcation well defined. Face like back. Ears short, greyish-brown. Fore limbs, from elbows downwards, and hands white. Hind limbs greyish externally to ankles; feet white. Soles naked, pads large and rounded; fifth hind toe, without claw, reaching to middle or end of the first phalanx of the fourth. Tail shorter than head and body, well haired; pale greyish above, white below, not shapely defined; scales small, about 16-18 to the centimeter.

Skull and teeth as described above.

Dimensions of the type, measured in the flesh :—Head and body 98; tail 73; hindfoot 16; ear 13.

Skull.—Greatest length 26·2; basilar length 21; zygomatic breadth 12·3; nasals 10; interorbital breadth 3·5; breadth of brain case 11; palatilar length 12·5; diastema 7·6; anterior palatal foramina 6; posterior palatal foramina 1·9; length of upper molar series 4·3.

Habitat.—Virawah, Thar and Parkar, Southern Sind.

Type.—Adult female. B. M. No. 11, 3, 13, 9. Collected 25th September 1910, and presented by Mr. E. Priestley, D. S. P., through the Bombay Natural History Society.

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This most interesting species, which I have named in honour of its captor, is remarkable for its striking resemblance to the local race of *Leggada platythrix*, an example of which was taken at the same time and place by Mr. Priestley. Before their skulls were examined, the two animals would have been supposed to belong to one species, had it not been that the unusual mammary formula of the *Pyromys* showed clearly on the skin.

In working out the generic position of this pecular animal it has become evident that, although the unwieldy genus *Epimys* cannot yet be satisfactorily broken up into natural groups, certain peripheral species may, as a preliminary, be separated from it. Such are the species that have been called "*Mus*" *mettada*, (more strictly *meltada*) *gleadowi* and *humei*, no one of which should be in a genus whose type is so essentially different an animal as the Black Rat (*Epimys rattus*, L.)

The following are the chief characters of the groups I propose to form :—

MILLARDIA,* g. n.

Sole pads 4 or 5, the fifth pad of *Epimys* always, and the sixth generally, suppressed. Fifth hind toe short, not reaching to base of fourth. Tail of medium length. Mammæ 2—2=8.

Skull generally as in *Epimys*. Palatal foramina very long. Posterior nasal opening of average breadth, close behind m^3.

Molars decidedly brachyodont, broad.

Type.—Millardia meltada (*Golunda meltada*, Gray. *Mus mettada* auct.) Other species, *listoni*, Wrought, and *comberi*, Wrought.

The most essential character of this genus is the suppression, total or partial, of the posterior sole pads, the structure of the posterior palatal regions remaining still as in *Epimys*.

GRYPOMYS, g. n.

Sole pads four only, the fifth and sixth suppressed. Fifth hind toe short, not reaching to base of fourth. Tail rather short. Mammæ 1—2=6.

* Named in honour of Mr. W. S. Millard, to whose enthusiastic help, in connection with the Bombay Natural History Society, so much of the recent progress of Indian Zoology is due.

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Skull very much as in *Pyromys* above described. Upper profile bowed. Supra-orbital ridges well developed. Posterior nares narrowed, the opening some way behind molars. Bullæ large.

Teeth as in *Pyromys*.

Type.—*Grypomys gleadowi* (*Mus gleadowi*, Murray).

This genus combines the foot structure of *Millardia* with the narrow and produced choanæ of *Pyromys*. A new born specimen even of *G. gleadowi* shows no trace of the fifth and sixth foot pads.

It may be noted that these three allied genera may be distinguished from each other by the number of their mammæ alone, these being in *Pyromys* 4—2=12 (*i. e.*, four pectoral and two inguinal pairs), *Millardia* 2—2=8, and *Grypomys* 1—2=6. True *Mus*, in the modern sense, containing the *Mus musculus* group, and *Leggada*, have 3—2=10. In *Epimys* the number varies from 1—2=6 to 3—3=12 but the anterior are never more numerous than the posterior. In the one Indian species of *Apodemus* (*A. arianus*) the number is 1—2=6. *Vandeleuria*, *Golunda* and *Hadromys* all have 2—2=8.

HADROMYS, g. n.

General appearance as in *Golunda*. Form stout. Tail rather short. Sole pads six. Fifth fore toe very short; fifth hind toe reaching just to base of fourth. Mammæ 2—2=8.

Skull shaped almost exactly as in *Golunda*, with the same short muzzle and well marked supra-orbital and parietal ridges. The anterior edge of the zygomatic plate is however concave, and the posterior palate ends behind the last molar.

Incisors very broad and heavy. Molars wholly unlike those of *Golunda*, more like those of *Epimys*, rather hypsodont, with lamminæ well defined. No unworn specimens are however available for examination.

Type.—*Hadromys humei* (*Mus humei*, Thos.*)

The wide difference of "*Mus humei*" from every other murine has long been evident, and its distinction as a special genus is now obviously called for. Its resemblance, both external and cranial, to *Golunda* is very striking.

* Described in detail, P. Z. S., 1886, p. 68.

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ON A SMALL COLLECTION OF RODENTS * FROM LOWER SIND.

BY

R. C. WROUGHTON.

The Society has sent me for indentification a small collection of Rodents made by Mr. E. Priestley, D.S.P., Thar and Parkar. Though small, the collection is an interesting one, containing specimens not only of a new genus and of a new subspecies of *Leggada platythrix* of the Dekhan, but also of *Gerbillus gleadowi* described by Murray in 1886 and not since rediscovered until now. The following is a list of the specimens; the number in brackets before the name of the species refers to Blanford's Mammalia.

(253 part) *Funambulus pennanti argentescens*, Wrought.

Funambulus pennanti argentescens, Wroughton, B. N. H. S. Journal, 1905, XVI, 3, p. 413.

♂ 133 (no skin), ♀ 136.

The type locality is Murree, but this specimen seems to differ in no essential particular.

(268). *Gerbillus gleadowi*, Mur.

1886. *Gerbillus gleadowi*, Murray, A.M.N.H. (5) XVII, p. 246.

♀ 5, 10, 17. (No. 17 presented to the National Collection.)

The type was taken by Mr. F. Gleadow, I. F. S., at Rohri in the extreme north of Sind; Mr. Priestley now, after 25 years, obtains it in the extreme south.

(265). *Meriones hurrianæ*, Jerd.

1867. *Gerbillus hurrianæ*, Jerdon, Mamm. of Ind. p. 186.

♂ 2, 4, 12, 14, 15, 23, 37—39. ♀ 1, 3, 11, 13, 16, 22, 31. (Nos. 4, 13, 23, 37 presented to the National Collection.)

(272). *Epimys rattus*, L.

1758. *Mus rattus* Linnæus. Syst. Nat. (10) 1, p. 61.

♂ 30, 33, 35, 36, ♀ 24—29. (Nos. 36 and 29 presented to the National Collection.)

[* Besides rodents some skins of the desert Cat *(F. ornata*, desert fox *V. leucopus)* several Mongoses (*Herpestes*) and two Hedgehogs *(Erinaceus)* were obtained but these could not be sent home in time to be incorporated in the present paper.—Eds.]

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These specimens are of course not true *rattus* and I can find nothing in the Museum Collection with which they exactly agree. Probably in the loose terminology of students of *rattus* from the plague point of view, *alexandrinus* would include these specimens. The whole series is extraordinarily constant in coloration.

(289 part). *Leggada platythrix sadhu*, sub-sp. n.

♂ 21. (Presented to the National Collection.)

Bennett originally described *platythrix* from specimens collected by Col. Sykes "in Dukhan" and stated its colour to be "fusco-canescens" and again "testaceous brown" with a greater or less admixture of black. The present is a true 'desert' form, 'drab-grey' darkening in the centre of the back to 'smoke grey.'

The skull closely resembles that of a specimen from Ahmednagar, which may be taken as typical; but the bullæ are smaller, the palatal foramina shorter, and the brain case shorter and deeper; the upper incisors are pale and white-tipped.

Dimensions of the type (measured in the flesh): head and body 79; tail 57; hind foot 17; ear 12·5.

Skull:—Greatest length 25; basilar length 21; zygomatic breadth 12; nasals 10; diastema 7·5; anterior palatal foramina 6; upper molar series 4·5.

Hab.—Lower Sind. (Type from Virawah, Thar and Parkar.)

Type.—Adult male. B. M. No. 11, 3, 13, 8. Original number 21. Collected by Mr. E. Priestley, D. S. P., Thar and Parkar, and presented to the National Collection by the Bombay Natural History Society.

(Gen. et sp. nov.)

♀ 20. (Presented to the National Collection.)

This interesting animal, owing to its characteristic desert colouring superficially, resembles the last so much that at a first glance it might be mistaken for it. Closer examination, however, proves it to be not only specifically but generically distinct. Mr. Thomas is dealing with it in a separate paper. I would suggest that the Society should try and induce Mr. Priestley to obtain more specimens including one or two adult females (with well developed mammæ) in alcohol.

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SOME MAYMYO BIRDS.

BY

MAJOR H. H. HARINGTON.

Maymyo, the principal Hill Station of Burma, is situated about 40 miles east of Mandalay on the edge of the Shan Hills, and is about 3,500 feet above sea-level. The country in the immediate vicinity of the station consists of a series of swampy hollows divided by low ridges covered for the most part by stunted oak and chestnut forest interspersed with patches of bracken. Many of these swamps have been drained, and numerous rides cut through the jungle and the station generally improved. From an ornithological point of view Maymyo is not very attractive, as many of the more interesting birds so plentiful in other parts of the Shan States seem to be wanting.

However, the country to the west of Maymyo and on the Ghâts looks very promising, being more varied from the endless sameness of the jungles immediately round Maymyo itself, and I have hopes on some future occasion of being able to manage a bit of birds' nesting between Mandalay and Maymyo.

Early in April 1910 I was ordered up to Maymyo with four Companies of my Regiment for musketry, and so had hopes of getting a few good eggs. With the exception of finding the breeding haunts of the Burmese Jay (*G. leucotis*), and a nest of *B. liventer*, I was not very successful.

We left Mandalay on the 11th April, and took four days for our march up. Owing to the heat and early marching I did not have much inclination or chance of indulging in bird's nesting until we reached the plateau.

On our arrival we were ordered out to Enlya, seven miles south-east of Maymyo, and it was here I did most of my collecting. The country was very disappointing and bird life not at all varied, also five or six hours a day musketry did not give much opportunity of getting further afield and trying new ground.

I have not included the migratory birds, only mentioning those actually noted during the breeding season, and no doubt there are

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still a great many more nesting species within a radius of a few miles of Maymyo.

No. 4. *Corvus macrorhynchus*, (Wagl.)—(The Jungle Crow.)

Very common, and should be kept down if the residents of Maymyo ever wish to get a decent head of game near the station, as the Jungle Crow is the worst poacher of the family, which is very well represented round Maymyo, and they must take a big toll of eggs and young birds.

No. 8. *Corvus insolens*, (Hume).—(The House Crow.)

Not so numerous as the above, keeping entirely to the station.

No. 12. *Urocissa occipitalis*, (Blyth.)—(The Red-billed Blue Magpie.)

Fairly common; I did not find any nests.

No. 18. *Dendrocitta himalayensis*, (Blyth.)—(The Himalayan Tree-Pie.)

Plentiful, I think I have also seen *V. rufa*.

No. 25. *Garrulus leucotis*, (Hume.)—(The Burmese Jay.)

The only other record, I believe, of the nesting of the Burmese Jay is a short note by Mr. K. C. Macdonald, sent by me to *The Journal*.

During former visits to Maymyo in the non-breeding season I found the Burmese Jay to be very plentiful in certain parts of the jungle and so always had hopes when opportunity occurred of procuring their eggs, and during my last visit my hopes were realised beyond expectation.

On the 13th April at Thandoung, the last stage in to Maymyo, I made my first attempt at birds' nesting, finding nests of *M. burmanicus*, Burmese red-vented Bulbul, *G. pectoralis*, Black-gorgeted Laughing Thrush, *C. affinis*, Burmese Roller and *B. liventer*, Rufous-winged Buzzard-Eagle. In the same bit of jungle as the last I was fortunate in finding my first nest of the Burmese Jay, *G. leucotis*, with the parent bird sitting very tight, in fact not moving, until my man began to ascend the sapling. The nest was placed about 10 feet from the ground and very conspicuous, and contained four incubated eggs, two of which were addled.

On the 30th April, Mr. P. F. Wickham arrived at my camp after we had finished musketry for the day, so we at once started out to try our luck in the neighbouring jungles, especially devoting ourselves to the Crest Bunting (*M. melanicterus*), which was common, but with no success. As Wickham had to return to Maymyo that evening we made an early start in that direction, trying some likely oak jungle with hopes of finding a Jay's nest. We were soon rewarded by first seeing a Jay and then two or three old nests. Then at last my orderly spotted a nest on which the old bird was sitting, which on investigation contained a nice clutch of four eggs. On resuming our hunt we were rewarded in finding another nest close by which contained three eggs. We found two more nests in the same patch of forest, each having two eggs apiece. These we left in the hopes of getting complete clutches. Of these four nests three were in saplings from 10 to

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12 feet from the ground and the fourth placed on a stump not four feet high.

On the evening of the 2nd of May I rode out to visit the last two nests and found one deserted and the other with its two eggs quite warm which when I attempted to blow I found to be on the point of hatching. On the afternoon of the next day I again visited the same jungle and found two nests, each containing five eggs, and another with three young birds which I left until the 9th, when one had disappeared. The two remaining young birds I brought down to Mandalay, one only surviving and is very tame. It was most extraordinary finding seven nests all within an area of about 100 square yards, one or two being within 20 yards of each other; shewing that *G. leucotis* when unmolested breeds in communities; also in every case except one the parent bird had to be driven off the nest.

On going into Maymyo later on I found two more nests, one with eggs and the other containing two young birds.

Nests.—The nests consisted of a rough outline of coarse twigs, containing a compact cup shaped lining made entirely of grass roots, which measured about six inches in diameter by five inches in depth. Four nests were placed in sapplings from 10 to 12 feet from the ground, one on a stump, and others on the branches of trees from 5 to 10 feet from the ground.

Eggs.—Nests containing incubated eggs were got of two, three, four and five clutches, shewing the bird to be irregular; one nest contained five addled eggs, and in many of the others one or two addled eggs were found. The eggs are of the regular family type and vary a great deal in size and colour, some being a uniform pale green with a dark zone round the larger end; others being distinctly speckled all over with darker greenish-brown spots, many having black hair-like streaks, which if one is not careful are very liable to wash off. The average of fourteen eggs was 1·3 × ·95, the largest being 1·43 × ·97, and the smallest 1·23 × ·92.

Since writing the above I am sorry to say the young Jay died in the Red Sea on its way home.

No. 32 (*a*). *Parus commixtus*, (Swinhoe.)—(The Chinese Grey Tit.)

Very plentiful, and its loud notes may be heard in most parts of the jungle.

On the 21st April I took a nest placed in a small hole in the trunk of an oak tree within a few yards of my tent. I watched the pair for three or four days and when the hen had apparently begun sitting I cut into the nest and was rewarded with a nice clutch of seven eggs. I secured both parent birds, as they do not seem to be so highly coloured as those procured at Sinlun Kaba, Bhamo District, also the eggs seem to be decidedly larger.

No. 67. *Dryonastes sannio*, (Swinhoe.)—(The White-browed Laughing Thrush.)

This is the common Laughing Thrush of the Shan Hills. I found several

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nests containing both eggs and young. Four seems to be the usual complement, sometimes three, and I found only one nest containing five eggs. The white type of egg is much the commonest at Maymyo. The variation in the colouring or want of colour in this bird's eggs is very interesting, as at Sinlun Kaba (Bhamo) I only found the white eggs late in the season, while at Taunggyi, to the south, I only got the blue variety.

No. 72. *Garrulax pectoralis,* (Gould.)—(The Black-gorgeted Laughing Thrush.)

Fairly common. I found three nests.

No. 73. *Garrulax moniliger,* (Hodge.)—(The Neck-laced Laughing Thrush.)

No nests; probably a later breeder.

No. 118*a*. *Pomatorhinus ripponi.* sp. n. (The Shan States Scimiter Babbler.) Described in the Bull. B. O. C., Vol. XXVII., p. 9.

On comparing my specimen with *P. olivaceus* in the Natural History Museum, I was struck with the difference in the colour of its wings from those of birds from Tenasserim which have a decided rufous edging to their primaries while my specimen has the outer edges of its wing feathers decidedly olive. I then compared them with specimens from the Shan States which I found to agree with mine. And on separating all the skins by their localities I find that those from the Shan States have the outer edges of their primaries olive-brown like their backs, and those from Tenasserim have the outer edges decidedly rufous. I left notes to that effect for Mr. Ogilvie-grant who kindly described the species for one as below.

P. ripponi is great skulker; its loud "Hoop-Hoop" and almost blackbird-like note may often be heard but the bird seldom seen. I failed to find a nest, but on the march up I saw one of a pair carrying a leaf, so they were evidently then nesting.

Pomatorhinus ripponi. sp. n.

Described in the Bull B. O. C., Vol. XXVII, p. 9.

Adult male and female most closely allied to *P. olivaceus,* Blyth from Lower Burma, but with general colour of the upper parts olive brown instead of rufous-brown; the tail similar in colour to the upper parts (in *P. olivaceus* it is much darker, blackish towards the tips and rufous towards the base), the chestnut patch on the sides of the neck somewhat paler, and the bill usually more slender. Total length ca. 8·3 inches, wing 3·4, tail 3·7, tarsus 0·85. Hab., Shan States.

No. 134. *Temelia jerdoni,* (Sharpe.)—(The Red-capped Babbler.)

Seen on several occasions.

No. 139. *Pyctorhis sinensis,* (Gen.)—(The Yellow-eyed Babbler.)

Common; we found several nests. It seems to be a much earlier breeder at Maymyo than at Taunggyi where it is equally common, as many eggs found early in April were on the point of hatching.

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No. 145. *Pyctorhis subochraceum*, (Swinhoe.)—(The Burmese-spotted Babbler.)

Seen and heard on several occasions.

No. 228. *Zosterops simplex*, (Swinhoe).—(Swinhoe White-eye.)

Plentiful. Two nests. The birds up here seem to run very near *Z. aureiventris* as noted by Colonel Rippon in his list of Birds of the Southern Shan States, in having traces of a yellow band down the centre of their underparts.

No. 243. *Aegithina tiphia*, (L.)—(The Common Iora.)

Very common. Nesting in the beginning of May.

No. 279. *Molpastes burmanicus* (Sharpe.)—(The Burmese Red-vented Bulbul.)

Very common. Breeding during April and May. Some of the birds round Enlya seem to run very near *M. nigripileus*.

No. 288. *Otocompsa emeria*, (Linn.)—(The Red-whiskered Bulbul.)

Common near water.

No. 317. *Sitta neglecta*, (Wald.)—(The Burmese Nut-hatch.)

I saw a single Nut-hatch on several occasions near my camp, but failed to find its nest.

No. 327. *Dicrurus ater*, (Herm.)—(The Black Drongo.)

Common. Were still in noisy flocks at the end of April when they paired off and started nesting operations.

No. 333. *Dicrurus cineraceus*, (Horsf.)—(The Grey Drongo.)

Plentiful. I found three nests building but was unfortunate over the eggs.

No. 335. *Chibia hottentotta*, (L.)—(The Hair-crested Drongo.)

Plentiful. An early breeder up here. I found hardset eggs early in April.

No. 374. *Orthotomus sutorius*, (Horsf.)—(The Indian Tailor-bird.)

Common.

No. 389. *Megalurus palustris*, (Horsf.)—(The Striated Marsh-warbler.)

One or more pairs in every swamp. Was only successful in finding one nest with hardset eggs.

No. 382. *Franklinia gracilis*, (Frankl.)—(Franklin's Wren-warbler.)

Plentiful and noisy, but had not started nesting before I left Maymyo.

No. 451. *Horornis pallidipes*, (Blan.)—(Blanford's Bush-warbler.)

A very noisy little bird, and a great skulker, inhabiting thick grass and bracken, and were evidently nesting in May. I made two attempts to find their nests by taking out a party of sepoys and systematically working through every square foot of grass, but failed to find any nest. My two specimens, both cocks, had their testes much enlarged and were evidently breeding. I have compared my specimens at the Museum and think this is the first record from the Shan States. I saw several *Cisticola*, *Suyas*, and *Prinia*, but as they had not begun nesting I did not collect specimens.

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No. 474. *Lanius collurioides,* (Less.).—(The Burmese Shrike.)

Very plentiful. We found several nests with eggs and young. I made a very fine series of eggs ranging from almost a bright red to dull grey.

No. 475. *Lanius nigriceps,* (Frankl.)—(The Black-headed Shrike.)

Saw none during the breeding season, but it is plentiful in Maymyo later on.

No. 481. *Lanius cristatus,* (L.)—(The Brown Shrike.)

Seen on two or three occasions, but as far as I could see not breeding.

No. 488. *Tephrodornis pondicerianus,* (Genel.)—(The Common Wood Shrike.)

No. 491. *Pericrocotus fratereulus,* (Swinhoe.)—(The Burmese Scarlet Minivet.)

Both fairly common, but I failed to find nests.

No. 500. *Pericrocotus perigrinus,* (L.)—(The Small Minivet.)

Common, breeding in May. I have taken nests at Taunggyi in March.

No. 510. *Graucalus macii,* (Less.).—(The Large Cuckoo Shrike.)

Seen on several occasions, as well as a species of *Campophaga* ?

No. 512. *Artamus fuscus,* (*Vieill.*).—The Ashy Swallow-Shrike.

A few to be seen in old Taungyas and probably breeds near Maymyo.

No. 515. *Oriolus tenuirostris,* (Blyth.).—(The Burmese Black-naped Oriole.)

One nest containing three eggs with parent bird procured on the 7th May. Two eggs were unfortunately broken when taking the nest which was situated at the end of a bough. *Nest* suspended between a fork, and composed of grass and grass down and lined with fine grass. Measured outside, 6 × 4×3 deep, and inside 4 × 3 × 2½ deep. Eggs of the family type.

No. 539. *Sturnia nemoricola,* (Jerd.)—(The White-winged Myna.)

No. 546. *Graculipica nigricollis,* (Payk.)—(The Black-naped Myna.)

An early breeder. Hardset eggs in the second week of April.

No. 547. *Graculipica burmanica,* (Jerd.)—(Jerdon's Myna.)

No. 549. *Acridotheres tristis,* (L.)—(The Common Myna.)

No. 553. *Æthiopsar grandis,* (Moore.)—(The Siamese Myna.)

No. 554. *Æthiopsar albicinctus,* (Godw. Aust.).—(The Collared Myna.)

All plentiful and common up at Maymyo, which seems particularly suitable to Mynas. When I got up to Maymyo on the 14th of April all the above were prospecting for nesting sites and having great squabbles amongst themselves over suitable holes.

No. 556. *Sturnopastor superciliaris,* (Blyth.)—(The Burmese Pied Myna.)

Common. Beginning nesting operations in May.

No. 605. *Rhipidura albicollis,* (Vieill.).—(The White-throated Fantail Fly-Catcher.)

Seen on several occasions.

No. 608. *Pratincola caprata,* (L.)—(The Common Pied Bush-chat.)

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Very common. Breeding in April and May, and probably earlier. I found three nests containing Cuckoos' eggs; one nest found by P. F. Wickham when we were out together was placed at the bottom of a hole in the ground at least 12 inches from the entrance, which was so narrow that no Cuckoo could possibly have got in, so that the egg must have been rolled into the nest, which contained five eggs of *P. caprata* and one Cuckoo's egg, showing that the Cuckoo had probably been unable to take out the customary one.

No. 663. *Copsychus saularis*, (L.)—(The Magpie Robin.)

Common.

No. 739. *Sporœginthus flavidiventris*, (Wallace.)—(The Burmese Red Munia.)

Plentiful in open grass lands. I also saw the Chestnut-bellied Munia *M. atricapilla* and either the Spotted Munia, *U. punctulata* or the Chinese Munia, *U. topela*. I did not collect specimens as they were not nesting while I was up at Maymyo.

No. 776. *Passer domesticus*. (L.)—(The House Sparrow.)

A few pairs about in the Station.

No. 779. *Passer montanus*, (L.)—(The Tree Sparrow.)

Very common indeed.

No. 781. *Passer flaveolus*, (Blyth.)—(The Pegu House Sparrow.)

Very plentiful, nesting freely in holes of tree stumps in old Taungyas.

No. 803. *Melophus melanicterus*, (Gen.)—(The Crested Bunting.)

Plentiful in the open country round Enlya. At first I was quite unsuccessful in finding their nests, but afterwards found three which were all placed on the tops of small mounds covered by small plants.

No. 847. *Anthus rufulus*, (Vieill.)—(The Indian Pipit.)

Plentiful. I found three nests, two containing young Cuckoos and one containing an egg. Wickham also found two containing Cuckoo's eggs.

No. 895. *Arachnothera asiatica* (Lath.)—(The Purple Sunbird.)

One nest found containing young in May.

No. 912. *Dicœum cruentatum*, (L.)—(The Scarlet Back Flower-picker.)

Common.

No. 948. *Gecinius striolatus*, (Vig.)—(The Little Scaly-breasted Green Woodpecker.)

In May I found a nest containing four fresh eggs, and secured the parent bird. The nest was placed in a hole about four feet from the ground.

No. 975. *Iyngipicus canicapillus*, (Blyth.)—(The Burmese Pigmy Woodpecker.)

Saw two or three parties of young birds about in May.

No. 998. *Thriponax feddeni*, (Blanf.)—(The Burmese Great Black Woodpecker.)

A pair seen on the march up from Mandalay.

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No. 1009. *Thereiceryx lineatus*, (Vieill.)—(The Lineated Barbet.)

Common.

No. 1119. *Xantholæma hæmatocephala*, (P. L. S. Mull.)—(The "Copper-Smith.")

Heard on several occasions.

No. 1023. *Coracias affinis*, (Mclell.)—(The Burmese Roller.)

Common. Nest found containing five incubated eggs on the 13th April.

No. 1044. *Halcyon smyrnensis*, (Linn.)—(The White-breasted Kingfisher.)

One nest found placed in a hole in the side of an old rifle pit containing two eggs.

No. 1067. *Upupa indica*, (Reich.)—(The Indian Hoopoe.)

One nest containing young birds found in May.

No. 1086. *Macropteryx coronata*, (Tick.).—(The Indian-crested Swift.)

On the march up saw a bird evidently sitting on its nest, which was placed fairly high up on a dead branch.

No. 1093. *Caprimulgus macrurus*, (Horsf.)—(Horsfield's Nightjar.)

Did not find any nests, but birds were calling at nights all round our camp.

No. 1104. *Cuculus canorus*, (Linn.)—(The Cuckoo.)

Very plentiful. We found eggs and young both in the nests of *P. caprata* and *A. rufulus*.

No. 1107. *Cuculus micropterus*, (Gould.)—(The Indian Cuckoo.)

Heard its complaining cry first on the 2nd May.

No. 1113. *Cacomantis merulinus*, (Scop.)—(The Rufous-bellied Cuckoo.)

Plentiful and very noisy in May; the cock-bird's call in an ascending scale of: "Did you do it?" "Did you do it?" "Did you do it?" and also "Tee, tee, tee, tee, ti-rou;" the hen-birds: "Ch'chee, we, wa, wo.," being continually heard.

I saw hen-birds being hunted by *Frankalina* on several occasions, but could find no signs of their nests. However, I shot a female *C. merulinus* containing a well-formed soft egg, showing they must have been laying somewhere.

No. 1117. *Surniculus lugubris*, (Horsf.)—(The Drongo Cuckoo.)

Seen and heard on several occasions. Its call is a regular series of whistling notes in a descending scale.

One morning I was attracted by a pair of Sunbirds (*A. asiatica*) making a great noise, and on going up I flushed a Drongo cuckoo from the ground but could find no signs of a nest. Eventually I saw the sunbirds had a young bird with them, but could find no reason why they were mobbing the Cuckoo.

No. 1119. *Coccystes coromandus*, (Linn.)—(The Red-winged Cuckoo.)

Fairly common and very noisy, and at night has a bisyllibic whistling

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note very like Collared Pigmy Owl (*G. brodei*) but with a more metallic sound.

No. 1120. *Eudynamis honorata*, (Linn.)—(The Indian Koel.)

Common, and often heard in jungles where there are no crows breeding. Query: were they laying in other corvine nests, such as Jays, Blue Magpies and Tree Pies, which are all plentiful up at Maymyo.

No. 1123. *Rhopodytes tristis*, (Less.)—(The Large Green-billed Malkoha.)

Seen on several occasions.

No. 1142. *Palæornis finschi*, (Hume.)—(The Burmese Slaty-headed Paroquet.)

Several parties of young birds about in May.

No. 1207. *Hierætus fasciatus*, (Vieill.)—(Bonelli's Eagle.)

A pair flew over our range on two consecutive afternoons.

No. 1221. *Butastur liventer*, (Temm.)—(The Rufous-winged Buzzard Eagle.)

On the 13th April, just before finding our first Jay's nest, we saw a Hawk's nest in a fairly high tree with the parent bird looking over the edge and gazing all round with her large yellow eyes, only leaving when myman reached the nest which contained three eggs on the point of hatching,—in fact, two of them were chipped and the young birds calling inside. however, with a little time and trouble they were made into fair specimens. The hen-bird, unfortunately, had to be shot for identification purposes. The eggs are a pure bluish-white, and measure 1·86×1·5, 1·83×1·53 and 1·9×1·53.

No. 1229. *Milvous govinda*, (Sykes.)—(The Common Kite.)

Plentiful round the barracks.

No. 1244. *Astur badius*, (Genel.)—(The Shikra.)

Seen on several occasions.

No. 1282. *Sphenocercus apicaudus*, (Hodgs.)—(The Pin-tailed Green Pigeon.)

One shot by a member of the Musketry School.

No. 1304. *Turtur orientalis*, (Lath.)—(The Rufous Turtle Dove.)

No. 1308. *Turtur tigrinus*, (Temm.)—(The Malayan Spotted Dove.)

Both common and breeding in April and May.

No. 1311. *Œnopopelia tranquebarica*, (Herm.)—(The Red Turtle Dove.)

Very plentiful, and nesting in May.

No. 1324. *Pavo muticus*, (Linn.)—(The Burmese Peafowl.)

No. 1328. *Gallus ferrugineus*, (Linn.)—(The Jungle Fowl.)

Both heard in the Forest Reserves.

No. 1331. *Phasianus burmanicus*, (Oates.)—(The Barred-backed Pheasant.)

Capt. Stewart, 10th Gurkhas, informs me he has shot this species near Maymyo as well as some species of Silver Pheasant.

I think it a great pity no attempt is made at Maymyo at game preserv-

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ing. With a little trouble a good stock could be easily established, and most probably the English Pheasant would do very well amongst the oaks and bracken.

No. 1374. *Francolinus chinensis*, (Osbeck.)—(The Chinese Francolin.)

Common.

No. 1382. *Turnix pugnax*, (Temm.)—(The Bustard Quail.)

Put up on several occasions.

No. 1398. *Amaurornis fuscus*, (Blyth.)—(The Ruddy Crake.)

Two nests found in May, one containing three eggs, the other seven.

No. 1401. *Amaurornis phœnicurus*, (Penn.)—(The White-breasted Moorhen.)

One nest found in May with three eggs.

No. 1485. *Gallinago stenura*, (Kuhl.)—(The Pin-tail Snipe.)

The last snipe seen by me were a pair on the 17th May.

No. 1572. *Ardetta cinnamomea*, (Genel.)—(The Chestnut Bittern.)

Plentiful.

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ORIENTAL FLYING SQUIRRELS OF THE "*PTEROMYS*" GROUP.

BY

R. C. WROUGHTON.

Excluding the peculiar trans-Himalayan genus *Eupetaurus* Blanford arranges the Indian Flying Squirrels in two genera, *viz*:—*Pteromys* and *Sciuropterus*. With the latter Mr. Thomas has dealt comparatively recently (A.M.N.H., 1908, p. 1), dividing up the group into 6 genera and 3 sub-genera, and it is with the former only that I propose to concern myself.

The name *Petaurista* has now been generally accepted in place of *Pteromys* as being some years older. Quite recently Dr. Stebbing has pointed out that '*petaurista*' meaning a 'rope-dancer' is masculine.

Thanks to the generosity of the Duke of Bedford, and exploration of the Mammal Fauna of China is now going on, and no doubt new material in this group will shortly be available, and I have therefore, under the circumstances, excluded from my review all the species of China, Formosa, &c. Finally, as the "*Petaurista*" group, south of Tenasserim has recently (A.M.N.H. 1908, p. 250) been dealt with by Mr. Thomas, I have entered the species in my Key, but have not again given detailed descriptions. I must note, however, that Pallas (Misc. Zool. p. 56, 1766) applied the specific name "*petaurista*" to the Javan animal very many years before Desmarest established *nitidus* for the same form, and consequently that name must be substituted for *nitidus* in Mr. Thomas' paper.

The superficial resemblance of *philippensis*, *lanka* and *cindrella* on the one hand, and *lylei* and *cineraceus* on the other is, I believe, a mere coincidence. The last two are almost certainly variations of *yunnanensis*, as is also *candidulus* of N. Burma, which extends west at any rate as far as Assam. The three former are most probably variations of *albiventer*, though it is just possible that they are also variations of *yunnanensis* through *candidulus*, parallel to the forms of Tenasserim and Siam.

P. albiventer seems to be the form of the eastern Sub-Himalayas (Nepal, Sikkim) (with *nobilis* at the higher altitudes) while the

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Western Himalayas produce *caniceps* and its allied forms, *inornatus*, and *birrelli*. The Simla form *fulvinus* seems most nearly related to *albiventer*.

I have treated all the forms as 'species'; the material available is not sufficiently representative of the whole area dealt with to enable any confident decision as to the inter-relations of the various forms. All that can be done is to recognise 4 groups as follows :—

(1) '*philippensis*' Group.....India, South of the Ganges.
(2) '*albiventer*' Group.....Himalayas.
(3) '*yunnanensis*' Group...Assam, Cachar, N. Burma, Tenasserim and Siam.
(4) '*petaurista*' Group.....Malaya, Sumatra, Java and Borneo.

KEY.

I. Dorsal area grizzled, spotted, or striped with white, yellow or buff.

A. Ground colour, at most, brownish or reddish black, never rufous or ochraceous.

a Size larger. Hindfoot 84mm.

a^1 General colour "claret brown," grizzled with white.

a^2 Paler, tuft behind ears rufous, belly white (Madras).
(1) *philippensis*, Elliot.

b^2 Darker, tuft behind ears black, belly 'salmon buff' (Siam).
(2) *lylei*, Bonhote.

b^1 General colour without any brown tinge.

a^2 Ground colour drab, grizzled with buffy white, tail grey throughout (Tenasserim).
(3) *cineraceus*, Blyth.

b^2 Ground colour black, washed with white, tail blackish (Ceylon).
(4) *lanka*, sp. n.

b Size smaller. Hindfoot 77. Ground colour mouse grey washed with white. Tail grey, darkening distally (Bombay Presidency).
(5) *cindrella*, sp. n.

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B. Ground colour rufous or ochraceous.

a Size smaller. Hindfoot 65-68. Molars 15-16·5.

a[1] Face coloured like back, cheeks rufous.

a[2] Paler, greyer, belly salmon buff (Kasmir).

(6) *inornatus*, Is. Geoffroy.

b[2] Darker, more rufous, belly orange rufous (Hazara).

(7) *birrelli*, sp. n.

b[1] Face grey (Sikkim).

(8) *caniceps*, Gray.

b Size larger. Hindfoot 70-84. Molars 17.

a[1] Size smaller, hindfoot 70-73. Back not grizzled but marked with a pale median line. Shoulders and parachute markedly paler than back. (Sikkim).

(9) *nobilis*, Gray.

b[1] Size larger. Hindfoot 75-84.

a[2] Shoulders paler than back, not grizzled.

a[3] Darker, dorsal area bay (Sikkim).

(10) *albiventer*, Gray.

b[3] Paler, dorsal area bright hazel, grizzled white (Simla).

(11) *fulvinus*, sp. n.

b[2] Shoulders grizzled entirely like back (Upper Burma, Cachar).

(12) *candidulus*, sp. n.

c[2] Back spotted, not grizzled (Molacea).

(13) *punctatus*, Gray.

II. Self-coloured, hands, feet, and tail tip black.

A. Size larger. Hindfoot 70 m.m.

a No black tuft behind ears.

a[1] Dark reddish brown (Java).

(14) *petaurista*, Pallas.

b[1] Orange hazel (Malay).

(15) *melanotus*, Gray.

b Black tuft behind ears.

a[1] Darker (Sumatra).

(16) *marchio*, Thos.

b[1] Paler, (Borneo).

(17) *rajah*, Thos.

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B. Size smaller. Hindfoot 60mm.

a Orange hazel (Natuna Islands.)

(18) *nitidulus*, Thos.

b Almost black. (Batu Islands.)

(19) *batuanus*, Miller.

(1) *Pataurista philippensis*. Elliot.

1839. *Pteromys philippensis*. Elliot, Madr. Journ., L. & Sc., p. 217.

1842. *Pteromys oral*. Tickell. Calc. Journ., N. H., ii, p. 401.

1843. *Pteromys griseiventer*. Gray. List. Mamm. Brit. Mus., p. 133.

Synonymy.—The name *philippensis* was given unintentionally by Elliot who ascribed it to Gray, but as the latter never published the name, and the former appended to it a valuable description, by the Rules of Nomenclature, the name must stand. It is greatly to be regretted and that is all there is to be said.

Pteromys oral was described by Tickell from Singhbhoom and has been generally used for the Madras form. I therefore leave it as a synonym of that species. It seems most probable, however, that it is an easily separable race, allied more nearly to the form found in the Bombay Presidency than to true *philippensis*.

Pteromys griseiventer was described by Gray without any type locality, but the type leaves no doubt that it is true *philippensis*.

Description.—Fur of back 40-45 mm. long. General colour above, 'claret brown'; washed with white; below, white. Individual hairs of the back basally 'smoke grey' (30 mm.), then seal brown (5 mm.) and lastly white (5 mm.) tipped black. Face like the back, cheeks grey, distal half of back of ears orange rufous, tuft behind ears rufous. Neck behind the ears, outside of limbs and parachute like back without the white grizzling and tinged ferruginous. Lower lip. black. Tail seal brown.

Size.—Head and body, 500; tail, 525; hindfoot, 84; ear, 40. Skulls, greatest length, 77; basilar length, 62; greatest breadth 50; molars, 17·5.

Remarks.—All the Madras specimens I have seen (except one) are referable to this form, but those from Travancore are most

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highly coloured without, however, approaching the bright colouring of the Himalayan forms. The one exception mentioned above is from the Shevaroy Hills, and both in size and colouring it more resembles the Bombay form. When material is available from the type locality of *oral* and from other places linking up with *cinderella* and *philippensis* some light will no doubt be thrown on the inter-relation of all these forms.

Note.—Since the above was written, I have examined 3 specimens kindly sent to me for that purpose by the Society. One from Supa in N. Kanara is practically a topo type of Elliot's *philippensis*. It is a young animal and less brightly coloured than a more mature beast would be. The other two, one from Hoshangabad, and a second from Rajputana, are apparently *cinderella*, though the latter, when more specimens are available, may prove to be yet another and still smaller form.

(2) *Petaurista lylei*, Bonhote.

1900. *Petaurista lylei*, Bonh. P. Z. S. 1901, p. 192.

Description.—Fur (40 mm.) long on back. General colour above as in *philippensis*; below salmon buff. Individual hairs of back basally drab grey (15 mm.), then hazel darkening to chestnut (15 mm.), and finally white (5-6 mm.) tipped black. Face like back but pattern finer, cheeks still finer, distal half of back of ears bright orange rufous, tuft behind ears black. Chin brown-black throat hazel, grizzled white (sometimes extending, as a medium line, down belly.) Parachute below bright rufous at extreme edge. Tail black, tinged reddish for $\frac{1}{4}$ length.

Size.—Head and body, 475; tail, 575; hindfoot, 85; ear, 50; Skull, greatest length, 80; basilar length, 63; greatest breadth, 52; molars, 17.

Remarks.—Though so like *philippensis* in very many ways I believe this form is most closely related to the Chinese *yunnanensis*, Anderson.

(3) *Petaurista cineraceus*, Blyth.

1847. *Pteromys petaurista cineraceus*, Blyth, J. A. S. B., XVI, p. 865.

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1859. *Pteromys cineraceus*. Blyth, J. A. S. B., XXVIII, p. 276.

Description.—Fur of back 35-40 mm. long. General colour above drab, grizzled with buffy white, much more finely so than in any other in this group, below white. Individual hairs of back basally 'fawn colour' (25 mm.), then vandyke brown with a subterminal white ring (3-5 mm.). Face like back but finer in pattern, cheeks and chin fawn colour. Forearm with a hazel tinge extending on to hands, feet black-brown. Tail grey throughout.

Size.—Head and body, 463; tail, 565; hindfoot, 84; ear, 40. Skull, greatest length, 80; basilar length, 63; greatest breadth, 53; molars, 17·5.

Remarks.—This species was recorded by Blyth from Arakan and Tenasserim. I have only seen 2 specimens from the latter locality. Probably when more material is available, it will be found that *cineraceus* is allied to *yunnanensis* and *lylei* much as *lanka* is to *philippensis*. It is difficult to imagine how it can be directly connected with those forms bounded as it is on the north and south by members of quite other groups.

(4) *Petaurista lanka*, sp. n.

A *Petaurista* in size and pattern quite like true *philippensis*, but entirely lacking the rufous tinge so characteristic of the latter species.

Fur of back 40-45 mm. long. General colour rusty black much washed with white, below greyish white (the individual hairs have short pale grey bases). Individual hairs of back basally 'mouse grey' (35 mm.) remainder white with black tips. Face and cheeks like back, but the pattern much finer. Hands and feet black. Tail dark.

Dimensions of the type.—Head and body, (c) 460; tail, (c) 560; Hindfoot, 85; ear, 43. Skull, greatest length, 77; basilar length, 60; greatest breadth, 48; molars, 17.

Habitat.—Ceylon.

Type.—Adult male. B.M. No. 96, 3, 27, 1. Collected and presented to the National Collection by C. B. Horsbrugh, Esq.

Remarks.—Three specimens examined. The characters are very constant and the individuals are at once recognisable by their

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dark, black and white colouring, almost without any trace of the red brown tinge so characteristic of *philippensis*.

(5) *Petaurista cinderella*, sp. n.

A *Petaurista* rather smaller than *philippensis*, approaching most nearly to the colouring of *lanka*, but much paler.

Fur of back 35-40 mm. long. General colour above 'mouse grey' washed with white, below white. Individual hairs of back smoke grey, darkening distally, with a sub-terminal white ring (5-6 mm.). Face and cheeks like back, but pattern finer. Front portion of parachute immediately behind forearm tinged buffy. Parachute below greyish white (hairs with grey bases). Hands and feet brownish black. Tail mouse grey darkening towards tips.

Dimensions of the type.—Head and body, 463; tail, 563; Hindfoot, 77; ear, 38.

Habitat.—Two specimens collected by myself in the Dangs, Surat District, Bombay Presidency.

Type.—Adult male. B. M. No. 96, 11, 7, 5. Original number 15.

Remarks.—This is the most sombre coloured form in this group; except the faint yellowish tinge behind the forearm there is nothing to relieve the general grey colouring. Judging from Tickell's description true *oral* is even smaller and at the same time more brightly coloured.

(6) *Petaurista inornatus*. Is. Geoff.

1844. *Pteromys inornatus*, Is. Geoff. Jacquemont Voy., IV.

Description.—Fur on back 45-50 mm. long. General colour above bay, washed or coarsely grizzled with buff, below salmon buff, rather darker towards sides of parachute. Individual hairs of back basally slate grey (25 mm.), then woodbrown darkening to burnt umber (15 mm.), remainder buff with black tips. Cheeks grey strongly tinged with rufous. Shoulders rufous, parachutes rather darker. Tail dull ochraceous buff with a black tip.

Size.—Head and body, 356; tail, 356; hindfoot, 66; ear, 40. Skull, greatest length, 65; basilar length, 55; greatest breadth, 46; molars, 15·5.

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Remarks.—There is a fine series of 6 specimens, presented by Col. Ward, in the Collection. There is a certain amount of variation in the brightness of the colouring.

(7) *Petaurista birrelli*, sp. n.

Fur as in *inornatus*, but general colour much darker than in that form. Much less markedly grizzled, the pale rings on the individual hairs 'ochraceous' or even darker. The cheeks are rufous with no sign of grey. Belly ochraceous buff rapidly deepening to rufous on the parachute. Tail bright bay, with a sharply marked black tip.

Dimensions of the type.—Head and body, 420; tail, 445; hindfoot, 65; ear, 46. Skull, greatest length, 73; basilar length, 58; greatest breadth, 47; molars, 16·5.

Habitat.—Muree, Hazara, Punjaub. Alt. 8,000 ft.

Type.—Adult female. B. M. No. 5, 11, 19, 3, original number 22, collected 30th July 1905, and presented to the Natural History Museum by Major Birrel, R.A.M.C.

Remarks.—Major Birrel got two specimens, the type and a young one on Mian Jaini Hill.

(8) *Petaurista caniceps*, Gray.

1842. *Pteromys caniceps*. Gray. A. M. N. H., X, p. 262.

1844. *Pteromys senex*, Hodg., J. A. S. B., XIII, p. 68.

Synonymy.—*Pteromys senex* was described by Hodgson from Nepal before 1842 but owing to a delay in preparing the plates was not published until 1844. In 1842 Gray described a Sikkim specimen as *caniceps*.

Description.—Size as in *inornatus* and *birrelli*. In general colouring it closely resembles *birrelli*, both above and below, but the whole head is drab grey and the hands and feet are ochraceous rufous and not black or partially black as in *inornatus* and *birrelli*.

Size.—The following dimensions were recorded by Hodgson:—Head and body, 350; tail, 400; hindfoot, 68. Skull, greatest length, 66; basilar length, 52; greatest breadth, 43; molars, 15.

Remarks.—This seems to be the form of the middle Himalayas.

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(9) *Petaurista nobilis*, Gray.

1842. *Pteromys nobilis*, Gray, A. M. N. H., X., p. 263.

1844. *Pteromys chrysothrix.*, Hodgson. J. A. S. B., XIII, p. 67.

Synonymy.—Hodgson's *chrysothrix* from Nepal was published at the same time as *senex* and Gray's *nobilis* from Sikkim at the same time as *caniceps*; Gray's name therefore stands for the species.

Description.—Size rather larger than *inornatus* and *caniceps*. Fur of back 35-40 mm. long. Back above from between the ears to root of tail bay (sometimes stopping somewhat sooner when the rump is coloured like the parachute) with a bright buff median line. The parachute bright buff darkening outwards to orange rufous; below entirely pinkish buff. Face like back but the forehead much tinged with buff. Hands and feet and tail ochraceous rufous, the last with a black tip.

Size.—Hodgson records the following dimensions for his *chrysothrix*:—Head and body, 375; tail, 380; hindfoot, 73. Skull, greatest length, 72; basilar length, 57; greatest breadth, 49; molars, 17.

Remarks.—There can be no doubt that this species is quite distinct from *albiventer*. It appears to be the high level representative of *albiventer* and not a seasonal phase of that species. A variation in the distinctness of the dorsal stripe is probably seasonal but even where the stripe is practically absent their size separates the two forms.

(10) *Petaurista albiventer*, Gray.

1834. *Pteromys albiventer*, Gray. Ill., Ind., Zool. II, pl. 18.

1836. *Sciuropterus magnificus*, Hodg., J. A. S. B., V., p. 231.

Synonymy.—*Pt. albiventer* was published as a plate figure without letterpress, describing it in 1837 (A. M. N. H., 1, p. 584). Gray gave the type locality as Nepal from whence also Hodgson's *magnificus* was described.

Description.—Size larger than *nobilis*. Fur of back 40 mm. long. General colour above bay grizzled with white on the back, buff on the shoulders, and orange rufous in the parachute; below

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ochraceous buff. Face like the back, cheeks grey. Hands and feet orange-rufous, tail the same with a black tip.

Size.—The dimensions recorded by Hodgson for *magnificus* are —Head and body, 400 ; tail, 550. The hindfoot averages 78. Skull, greatest length, 70 ; basilar length, 56 ; greatest breadth, 47 ; molars, 17.

Remarks.—This is the low level form of the Eastern Himalayas.

(11) *Petaurista fulvinus*, sp. n.

A *Petaurista* of the *albiventer* type but back and parachute less contrasted in colour and with fulvous tinge throughout.

Fur 35-40 mm. long on the back. General colour above hazel, grizzled with white on the back, darkening on the outside edges of the parachute, and brightening to ochraceous rufous on the shoulders and behind the forearm ; below pale rufous. Individual hairs of the back olive grey basally (15 mm.), remainder bright fulvous hazel with a black tip and sub-terminal white ring (5 mm.) Face like back. Cheeks white, tinged rufous. Hands and feet cinnamon rufous. Tail 'vinaceous cinnamon' much tinged with fulvous.

Dimensions of the type.—Not recorded. The hindfoot is 77 mm. and the other dimensions are no doubt quite as in *albiventer*. Skull, greatest length, 70 ; basilar length, 50 ; greatest breadth, 48 ; molars, 16.

Habitat.—Simla.

Type.—Adult male. B. M. No. 85, 8, 1, 121. Collected by W. Davison and presented to the national collection by A. O. Hume, Esq.

Remarks.—Represents *albiventer* in the West Himalaya.

(12) *Petaurista candidulus*, sp. n.

1888. *Pteromys yunnanensis*, Blanf. (nec. Anderson) Faun., Brit. Ind., p. 364.

A large *Petaurista* of the *yunnanensis* type, of paler colouring and so much washed with white on the back as almost completely to obscure the ground colour.

Fur of back 30-35 mm. long. Colour above so washed with

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white as to appear drab, parachute rufous; below pure white, tinged with rufous on outer edges of parachute. Individual hairs of the back basally 'mouse grey' (20 mm.), then reddish (5 mm.), and remainder reddish white with a very short black tip (2-3 mm.). Head coloured like back, face becoming white with slight rufous tinge, cheeks white, a grey patch in front of ears, bay tuft behind them.

Distal half of back of ear white. Hands and feet rufous like parachute. Tail drab grey, with well marked black tip.

Dimensions of the type.—Recorded by the Collector.—Head and body, 405; tail, 610; hindfoot, 84; ear, 44. Skull, greatest length, 77; basilar length, 60; greatest breadth, 51; molars, 17·5.

Habitat.—Upper Burma westward to Cachar whence the Museum possesses a specimen. Type from Kindat, Upper Burma.

Type.—Adult male. B. M. No. 10, 10, 19, 3. Collected 20th August 1907, and presented to the Natural History Museum by C. H. Hobart, Esq.

Remarks.—There are specimens in the Museum Collection from Cachar and the Naga Hills. Blanford called these *yunnanensis*, but that species is quite a dark animal, with comparatively little grizzling and with a black tail. I think there can be no doubt that notwithstanding their utterly different facies, this species, *yunnanensis*, *lylei*, and *cineraceus* are very closely related.

When specimens are available from the Shan States it is quite probable that the form of that country will prove to be true *yunnanensis*.

(13) *Petaurista punctatus*, Gray.

1846. *Pteromys punctatus*, Gray, A. M. N. H., XVIII, p. 211.

This species was based on a specimen from Malacca and is quite distinct from any other known form, by its peculiar pattern of white spots on a hazel-brown ground. It is noteworthy that other specimens from Malacca agree with *melanotus* the normal Malay form. The general type of coloration seems rather to ally it with *yunnanensis*. Personally I believe the specimen to be abnormal but it is useless to speculate until more specimens are available.

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(14) *Petaurista petaurista*, Pallas.

1766. *Sciurus petaurista*, Pall. Misc. Zool., p. 54.

(15) *Petaurista melanotus*. Gray.

1836. *Pteromys melanotus*, Gray, P. Z. S., p. 88 (noneneed).

1837. *Pteromys melanotus*, Gray, A. M. N. H., I., p. 584.

(16) *Petaurista marchio*, Thomas.

1908. *Petaurista nitida marchio*, Thos., A. M. N. H., p. 250.

(17) *Petaurista rajah*, Thomas.

1908. *Petaurista nitida rajah*, Thomas, A. M. N. H., p. 250.

(18) *Petaurista nitidalus*, Thomas.

1900 *Pteromys nitidalus*, Thos., Nov., Zool., VII., p. 592.

(19) *Petaurista batuanus*, Miller.

1903. *Pteromys batuanus*, Miller, Smiths and Coll. XLV., p. 27.

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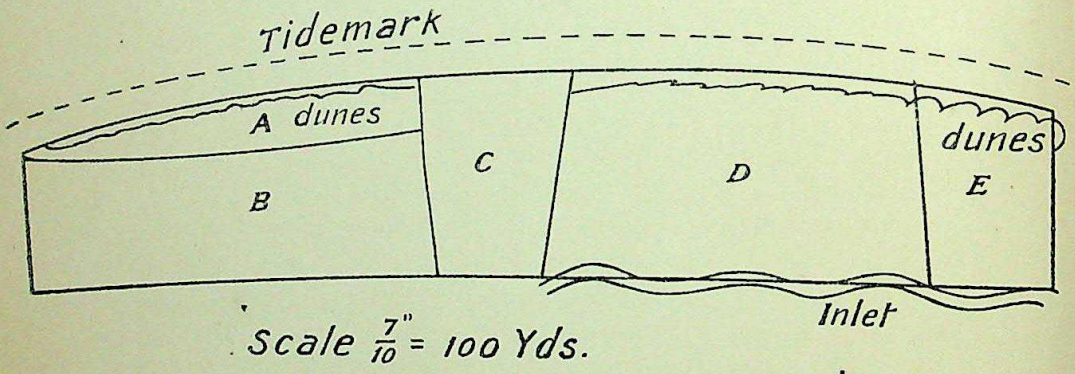
A STUDY OF SEASHORE VEGETATION

BY

W. BURNS, B.SC. (EDIN.).

(*From the Botanical Laboratory of the Poona Agricultural College.*)

In September 1910, I made a short study of the flora of a typical area on the seashore, near Bassein, in the Thana District. Bassein is situated at the mouth of the Kalyan creek. Between the village and the estuary lies a barren tract of land partially intersected by muddy inlets and useful only for grazing. At the extreme seaward edge of this runs a very bare strip of land after which there is a slight drop and the beach proper begins. The present paper refers to the vegetation of the bare strip of land for a distance of about 1,100 yards from the suspension bridge on the coast there. Observations were started about 250 yards from the bridge, since from that place the strip was fairly uniform in its general appearance. The following rough sketch gives an idea of the nature of the ground.



The whole area is divided up into five secondary areas: A, B, C, D and E. In A there was no vegetation. The dunes here were low and the land immediately behind them was very exposed, hence the lack of plants on this spot. In B, however, plants began to appear. These were (1) seedlings of *Avicennia alba*, the mangrove plant, that is so common on the coast. These were not very big and had obviously been recently deposited. The biggest had only two young foliage leaves showing above the cotyledons. In an area of 25′ × 25′ ten such seedlings were found. This place was fifty yards from the high tidemark of the season. At the tidemark, just opposite the above mentioned area, the seedlings of *Avicennia* were very numerous. In an area 8′ × 3′ the number of *Avicennia* fruits found was 169; most of these had begun to germinate but none were fully rooted.

The other plants on this area of 25′ × 25′ were (2) a small monocotyledonous plant like an *Iphigenia*, (3) the grass *Cyperus conglomeratus*, (4) the grass, *Cynodon dactylon*. These were sparsely scattered over the area.

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In the whole of B, besides specimens (2), (3) and (4) above mentioned, there were also found (5) *Launea pinnatifida*, a creeping stoloniferous composite, and (6) a Labiate, *Lippia nodiflora*, which held together small sand hills of about six inches high, on top of which its flowers and fruits appeared. All these plants were still very sparsely scattered with large intervals of bare sand.

At about 600 yards from the bridge began the area marked C. This area was absolutely bare of vegetation throughout its whole depth. The reason was not far to seek. The dunes at this place had disappeared and the wind had an absolutely unrestricted sweep over the barren tract. With the reappearance of dunes vegetation also reappeared and formed area D bounded on one side by the dunes and on the other by a small muddy inlet. In this inlet were seen the first adult Avicennias met with in that morning's excursion, and along with them the following plants:—(4) *Cynodon dactylon*, (7) *Sueda fruticosa*, (8) *Acanthus ilicifolius*, and (9) *Sesuvium portulacastrum*. A little way from the inlet towards the centre of the area, appeared Avicennia seedlings, but it was apparent that these were not from the plants in the inlet since the latter were not fruiting. Still nearer the sea in this same area appeared small isolated clumps of (10) *Ipomea biloba*. These were the outposts of the main body of this plant which completely covered area E. Seedlings of this Ipomea had been met in previous areas but only in D did the plant first appear in clumps and seemed to be forming small dunes. The grass (11) *Panicum colonum* was also found here represented by a few scattered specimens.

In area E there was, as above mentioned, a thick mat of *Ipomea biloba* and the dunes here were higher than at any other point in the areas surveyed, on account of the sand-binding properties of this plant. The Ipomea was in flower and a few fruits were also visible. There was little along with the Ipomea except one intrusive piece of turf and a few scattered grasses and sedges. These were as follows:—

(12) *Pycreus polystachyos*, (13) *Fimbristylis diphylla*, (14) *Cyperus malaccensis*, and (15) *Sporobolus glaucifolius*. There was also one sickly plant of (16) *Calotropis gigantea* and a stunted specimen of (17) *Erythrina indica*.

The Ipomea patch was only 100 yards broad and no more was visible for at least two miles.

Leaving out the doubtful Iphigenia the following list shows the plants found and their natural orders:—

Natural Order.	Plant.
Leguminosæ	(17) *Erythrina indica.*
Compositæ	(5) *Launea pinnatifida.*
Acanthaceæ	(8) *Acanthus ilicifolius.*
Chenopodiaaceæ	(7) *Sueda fruticosa.*
Asclepiadaceæ	(16) *Calotropis gigantea.*

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Verbenaceæ	(1) *Avicennia alba.* (6) *Lippia nodiflora.*
Cyperaceæ	(3) *Cyperus conglomeratus.* (14) *Cyperus malaccensis.* (13) *Fimbristylis diphylla.* (12) *Pycreus polystachyos.*
Gramineæ	(4) *Cynodon dactylon.* (15) *Sporobolus glaucifolius.* (11) *Panicum colonum.*

The nature of almost all the plants in the above group shows how severe and limiting was the environment. The Erythrina and Calotropis were very unhappy, and obviously accidents in the vegetation. Almost every one of the other plants is specially adapted to growth on seashores. Some of these plants are worthy of a little further attention.

* Schimper, quoting St. Hilaire, informs us that *Lippia rotundifolia* is found as a part of the typical flora of the campo of Minas Gerae in South America, in land which is true savannah in the depressions and pure steppe on the heights. Its near relation *Lippia nodiflora* occurs, as we have seen, in not very dissimilar conditions on the Bassein coast.

The three grasses found and the sedges *Cyperus conglomeratus* and *Fimbristylis diphylla* are not typically littoral but are of wide distribution and of that adaptability displayed by so many members of these two orders.

† *Pycreus polystachyos* is a plant of wide distribution but with a distinct preference for maritime regions.

‡ *Cyperus malaccensis* is found on brackish mud banks from Bengal to Singapore and distributed in Asia, Australia and Polynesia.

The following three distinct ecological groups are noticeable:—

Sand-binders	*Ipomea biloba.* *Lippia nodiflora.* *Launea pinnatifida.*
Succulents	*Sesuvium portulacastrum.* *Sueda fruticosa.*
Mangrove plants	*Avicennia alba.* *Acanthus ilicifolius.*

Here then, we have three of the groups most typical of tropical seashores. The habit of the sand-binders is remarkable. § Schimper makes the following remarks concerning it:—

"The advantages due to this mode of growth in such habitats are

* Schimper: Plant Geography, 1903, p. 373.

† Hooker: Flora of British India, VI, p. 592.

‡ Hooker: Flora of British India, VI, p. 609.

§ Schimper: Plant Geography, 1903, p. 182.

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obvious. The creeping shoots firmly anchored by numerous deeply penetrating roots offer a much better resistance to the wind and incur much less danger of being torn out of the loose shifting substratum than do erect plants. It is, therefore, no wonder that many other littoral plants adopt a mode of life similar to that of *Spinifex*, such as *Remirea maritima* which is almost ubiquitous in the tropics and the still commoner and more widely distributed *Ipomea pes-capræ* (*I. biloba*) the extremely long and distantly rooting creeping shoots of which cover and fix the sand in a narrow-meshed net."

The mangrove plants are specially adapted to growth in heavy muddy soil. The peculiar negatively geotropic roots of *Avicennia* are its means of securing oxygen for its feeding roots buried in the swampy land.

The succulents are typical of saline soil, their fleshiness being due to the development of water tissues specially adapted to guard against injurious concentration of salt in the assimilating cells.*

Considering the number of *Avicennia* fruits deposited on the shore and the number that had been taken up to the higher part of the beach I was astonished to note how few adult *Avicennia* plants there were outside the muddy inlet. This may be due to the sand drying after the rains, but it is certainly also due to the fact that cattle wandering along the shore greedily devour the *avicennia* fruits washed up by the tide. A herdsman told me that cattle and buffaloes do not eat the *Ipomea biloba* at all. Hence if any change takes place in the vegetation of the areas described we may expect that it will not be an advance and increase of the mangrove plants but mainly of the sand-binders and possibly of the succulents.

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* Schimper: Plant Geography, 1903, p. 89.

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NOTES ON GAME ANIMALS FROM NEAR GYANTSE AND IN THE CHUMBI VALLEY.

BY

CAPTAIN F. M. BAILEY.

(With a Plate).

After a residence of 3½ years at Gyantse and in the Chumbi Valley, I venture to think that a few random observations in the game animals found in those places may be of interest to readers of this journal.

The two localities are entirely different in character and fauna. Gyantse lies a hundred miles to the north of the main Himalayan watershed, at a height of 13,000 feet, and has an average rainfall of some seven inches, the surrounding country being treeless and bare, except for thorny scrub in some of the stream beds; while the road reaches a height of 15,200 feet where no vegetation except scanty grass and moss can exist. Chumbi on the other hand is on the southern slopes of the Himalayas, the annual rainfall at the British Trade Agency (at 9,800 feet) being about seventy inches. The ground here is much steeper and is covered with pine and rhododendron forest to a height of 14,000 feet. The fauna of Chumbi resembles that of the Upper Himalayan Valleys, while that of Gyantse is Tibetan, and the Tibetan fauna extends into the Chumbi Valley for a few miles south of the Tangla. Game is generally plentiful at places a short distance on either side of the road. In May 1909, on one day's march, I saw 17 *Ovis ammon*, 25 Burhel and 64 Tibetan Gazelle. A list of the game animals shot during the four years 1906-1909 is appended. Only shootable heads were entered in the game book:—

Ovis ammon.	Burhel.	Tibetan Gazelle.	Musk Deer.	Wolves.	Foxes (*V. Wadelli*).	Hares (*L. Oiostolus.*)
7	11	42	1	2	5	621

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FELLS UNICA. Snow Leopard. Tib.—"*Sa.*"

The snow leopard occurs near Gyantse but is rare. I have not heard of it in the Chumbi Valley. On 21st June 1908 I obtained a litter of three young ones which must have been born about a week previously.

CANIS LUPUS. The Wolf. Tib.—"*Changu.*"

These are not uncommon in this part of Tibet, but are not seen much on the main roads. A female measured 54½" in length from nose to tip of tail and 26" in height at the shoulder. I kept young ones, but they were always wild and timid. On one occasion a six months' old cub escaped, and after chasing it for four miles on horseback, I gave up all hope of recapturing it. I was much surprised to find that it had returned of its own accord during the night, and was waiting to be fed at the usual hour in the morning. I once shot a black wolf in Western Tibet, where

The plate accompanying this paper will appear in the Index number?

vixen measured 12" from nose to tip of tail and 19½" in height at the shoulder. I have killed these with greyhounds.

VULPES FERRILATUS. The small Tibetan Fox. Tib.—"*Dedze.*"

I have never seen this fox below 14,000 feet, at which elevation I have occasionally seen it at Phari. I once shot one that had just killed a mouse hare (*Lagomys*).

LEPUS OIOSTOLUS. The Wooly Hare. Tib.—"*Regong.*"

This hare is very common in this part of Tibet, where it is found on the hills around Gyantse and also in the thorny scrub in the river bed. It is also common on the slopes of Chumolhari on the Tangla, but does not occur in the Chumbi Valley. I used to course these hares, but it was difficult to find them on level ground and in hills the greyhound had no chance.

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into the Chumbi Valley for a few miles south of the Tangla. Game is generally plentiful at places a short distance on either side of the road. In May 1909, on one day's march, I saw 17 *Ovis ammon*, 25 Burhel and 64 Tibetan Gazelle. A list of the game animals shot during the four years 1906-1909 is appended. Only shootable heads were entered in the game book:—

Ovis ammon.	Burhel.	Tibetan Gazelle.	Musk Deer.	Wolves.	Foxes (*V. Wadelli*).	Hares (*L. Oiostolus.*)
7	11	42	1	2	5	621

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FELLS UNICA. Snow Leopard. Tib.—"*Sa.*"

The snow leopard occurs near Gyantse but is rare. I have not heard of it in the Chumbi Valley. On 21st June 1908 I obtained a litter of three young ones which must have been born about a week previously.

CANIS LUPUS. The Wolf. Tib.—"*Changu.*"

These are not uncommon in this part of Tibet, but are not seen much on the main roads. A female measured 54½" in length from nose to tip of tail and 26" in height at the shoulder. I kept young ones, but they were always wild and timid. On one occasion a six months' old cub escaped, and after chasing it for four miles on horseback, I gave up all hope of recapturing it. I was much surprised to find that it had returned of its own accord during the night, and was waiting to be fed at the usual hour in the morning. I once shot a black wolf in Western Tibet, where they are commoner than in other parts of the country. I have seen three black ones together and one black one in the company of three ordinary wolves. I once tried to course a wolf with three greyhounds. The wolf showed no fear and the hounds would not tackle him when they had caught him up.

VULPES WADDELLI. Tib.—"*Wamo.*"

This fox is not uncommon in the scrub round Gyantse, and I have also found it on bare plains at a height of 15,000 feet. A vixen measured 42" from nose to tip of tail and 15½" in height at the shoulder. I have killed these with greyhounds.

VULPES FERRILATUS. The small Tibetan Fox. Tib.—"*Dedze.*"

I have never seen this fox below 14,000 feet, at which elevation I have occasionally seen it at Phari. I once shot one that had just killed a mouse hare (*Lagomys*).

LEPUS OIOSTOLUS. The Wooly Hare. Tib.—"*Regong.*"

This hare is very common in this part of Tibet, where it is found on the hills around Gyantse and also in the thorny scrub in the river bed. It is also common on the slopes of Chumolhari on the Tangla, but does not occur in the Chumbi Valley. I used to course these hares, but it was difficult to find them on level ground and in hills the greyhound had no chance.

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EQUUS HEMIONUS. Tib.—"*Kyang.*"

This animal may be seen anywhere between the Tangla and Mendza on the road to Gyantse; after the latter place the valley is too confined, as they prefer very wide open plains. They are easy to approach and show very little fear of man. On one occasion when camped at the village of Nyiru, to the east of Kangmar, I was asked by the people to shoot one, as they did considerable damage to the crops. The young are born in August. A photograph of a young one appeared on p. 731 of Vol. XIX of our Journal.

OVIS AMMON HODGSONI. Tib.—"*Nyen.*"

Ovis ammon are occasionally to be found in the hills at the northern end of the Chumbi Valley and at several places on the road to Gyantse. The young are born in June; I have frequently seen newly-born lambs in this month and at the beginning of July. I once saw a ewe apart from a herd with a single lamb at the end of June, at a height of 14,000 feet, where some small rhododendron bushes were growing which concealed the young one when it lay down. A photograph of the best head obtained appeared in Vol. XIX, page 980. Rowland Ward's measurements for this head were :—

Length on Front Curve	49½"
Circumference..	19"
Spread from tip to tip	21¼"

OVIS NAHURA. Burhel. Tib.—"*Na.*"

Burhel are very common both in the Chumbi Valley above tree level, and in the neighbourhood of Gyantse as well as at various places on the road. The eleven entered in the game book measure between 20 in. and 23 in.; smaller ones were occasionally shot for food. I kept several tame ones which, though never tied up, seldom strayed far. On two occasions single young were born to these, on the 15th June and 8th August; but from what I have seen of young ones with the wild herds I think that August is exceptionally late. Once a tame ram, 2½ years old, was lost for two days and eventually found with a herd of wild ones, which he left and ran to the man who was searching for him. The horns of this one measured 13 ins. when three years old. These

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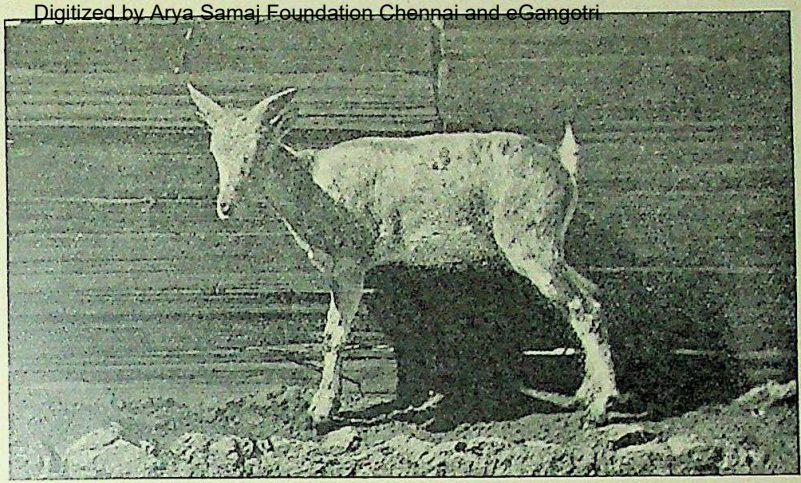

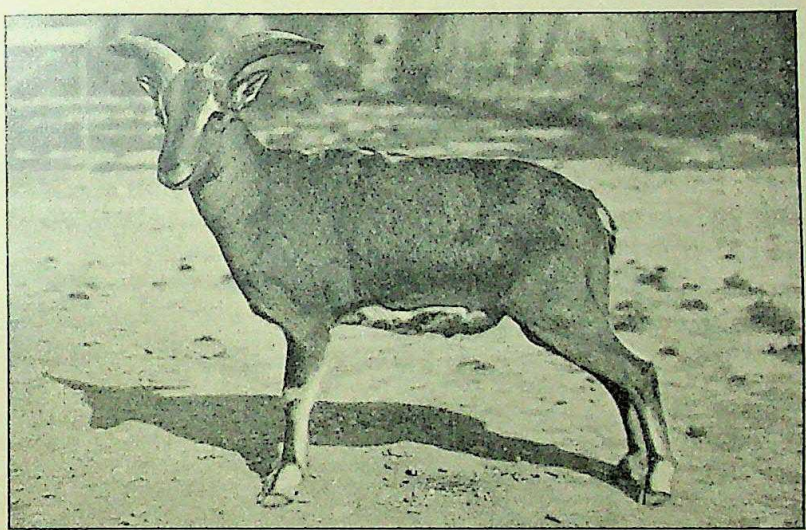

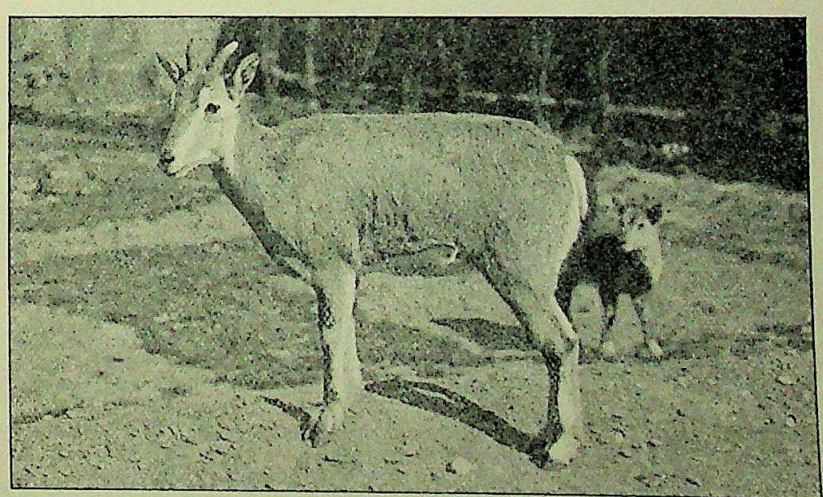

THE BHARAL (*Ovis nahura*).
TOP: Young male, 16 months old. MIDDLE: Male, 3 years old.
BOTTOM: Female, 2 years old, with kid.

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tame burhel were very fond of playing with my dogs and even with men.

GAZELLE PICTICAUDATA. Tibetan Gazelle. Tib.—"*Goa.*"

Gazelle are still fairly plentiful on the road to Gyantse, being found from the hills south of Phari up to the neighbourhood of Gyantse; on the road itself they are much scarcer and wilder than they used to be. The horns of those entered in the game list measured between 10½ ins. and 14 ins.; only one head of the last measurement was shot (by Captain Kennedy) though 13½ ins. heads were not uncommon.

The following are the measurements of two gazelles:—

Nose to tip of tail	38″	37¾″
Height at shoulder	24½″	22″
Length of horn	12″	11½″

In Western Tibet they are much wilder and more difficult to approach than in the country to the north of Sikkim. On one occasion, when camped near Kamba Jong I counted 117 in sight from my tent. I found the young difficult to rear in captivity. A photograph of one appeared at p. 121 of Vol. XIX of our Journal. A greyhound of mine once caught a full grown buck.

CERVIS AFFINIS. The Shou. Tib.—"*Sha.*"

These stags are found in the Chumbi Valley, their lowest elevation being about 9,000 feet. They are very scarce, a few only crossing the ridge which forms the boundary between Chumbi and Bhutan. I have seen them grazing on Lingmotang Plain in May, when the stags had no horns, and in the winter they are to be found in the dense pine forests, on the eastern side of the Chumbi Valley; but about December the forest is disturbed by the villagers, who at this time are collecting their winter's supply of fuel, and the stags appear, for the most part, to return eastwards to Bhutan. They rarely cross to the western bank of the Ammo Chu and this river may be said to be the limit of their habitat on the west.

I saw in captivity at Shigatse a stag which belonged to the Tashilama, and which I was informed had been obtained from the Bramaputra Valley, east of Lhasa; but I am unable to say to what species it belonged. I found that the roofs of many houses in

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Tibet north of Nepaul were adorned with stag horns which, I was told, had been brought from the north, but as the country is bare desert for hundreds of miles in that direction, I think it possible that these horns came from Nepaul. I was unable to bring any horns away as they had become too brittle from exposure to the weather, and in spite of the greatest care, broke in pieces after a few marches.

MOSCHUS MOSCHIFERUS. Musk Deer. Tib.—"*La*."

A few Musk Deer are to be seen in the Valleys round Gyantse. In the absence of forest in this part of their habitat, they live among rocks. They are plentiful on the ridge dividing Sikkim from the Chumbi Valley and probably at other places in the neighbourhood.

A few other animals may be mentioned here.

The Serow Tib. "*Gyara*" is common in the Chumbi Valley, but difficult to shoot. It is not found above tree level. A photograph of one appeared at p. 822 of Vol. XIX of the Journal.

I have seen a Gooral, which had been killed by a native in the Chumbi Valley, but have never seen one alive myself.

Wild Yak (*Bos grunniens*) and Tibetan Antelope (*Pantholops hodgsoni*) are not found in this part of Tibet at all. In travelling up the Bramaputra, antelope were not seen till about the 85° of longitude, and then in the hills to the north of the river. They were common some distance farther west. The Tibetan name for the wild Yak is "*Drong*" and for the Antelope "*Tso*". I have never heard the word "*Chiru*" used for this animal in Tibet.

A bear was occasionally seen by wood-cutters in the Chumbi Valley. A new species of monkey (*Presbytis lania*) is found in the Chumbi Valley at an altitude of 10,000 feet. The Lynx, Tib. "I" (as the letter E), is found near Gyantse but is rare. A *badger*, *Meles meles canescens* was obtained in the Chumbi Valley and the skin forwarded to the Society.

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REMARKS ON THE SNAKE COLLECTION IN THE QUETTA MUSEUM.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

At the request of Sir Henry McMahon the collection of snakes in the Quetta Museum has been recently submitted to me for identification.

120 specimens were forwarded which include 23 species. One species, I think there can be no doubt, is new to science. This belongs to the genus *Contia*, and I propose to call it *mcmahoni* after the President of the Quetta Natural History Society. In a few other instances the previously known habitat appears to have been extended, *viz.*, *Eryx johni*, *Zamenis ravergieri*, *Contia walteri*, *Bungarus cœruleus*, and *Bungarus sindanus*.

All the snakes have been collected in Baluchistan.

Family.—GLAUCONIIDÆ.

Glauconia blanfordi (Boulenger).

A single typical specimen of this little snake is from Sibi.

Family.—BOIDÆ.

Eryx johni (Russell).

Three specimens, all about two-thirds grown, are from Duki, and Hanna. I can find no previous records of this snake from Baluchistan. The Hanna specimen is the darkest I ever saw. It is brown dorsally, and there are very distinct black bars on the body and tail. The belly is heavily mottled with black. The two Duki specimens are similar, but the black bars are not so distinct. The details of scales and shields are as follows :—

Costals.			Ventrals.	Sub-caudals.	Locality.
Two heads-lengths behind head.	Mid-body.	Two heads-lengths before vent.			
47	53	41	190	33	Hanna.
42	47	34	199	33	Duki.
44	51	38	200	29	Duki.

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Family.—COLUBRIDÆ.

Tropidonotus piscator (Schneider).

Four specimens from Harnai, Sibi, Kirta and Sharigh. All are olive-greenish with moderately large black chequers anteriorly; and quite typical in lepidosis.

Lycodon striatus (Shaw).

Three specimens from Quetta. One in particular shows a bright yellow adornment similar in pattern to the white observed in the usual Indian specimens. Probably the others were similar, but the bright yellow is sure to fade in spirit as it does in other *Lycodons* (*jara*, *flavomaculatus*, and *fasciatus*). The ventrals and subcaudals are 179 ? + 60, 180 + 63, and 176 ? + 63. There are 9 supralabials in one specimen on the left side, and the 3rd, 4th, 5th and 6th touch the eye on that side.

Zamenis mucosus (Linné).

Six specimens from Quetta and Hanna. One large adult is unusually dark being a uniform blackish dorsally. In two specimens the loreals are two (1 + 1).

Zamenis rhodorhachis (Jan.).

Several specimens, all of variety *ladacensis* (Anderson) from Quetta, Fort Sandeman, Hanna, Duki, Mach, Takatu, Spinkarez (Hanna), and Sibi. The supralabials are 9, the 4th is invariably divided and its upper part touches the eye. I think there can be no doubt that this is the correct interpretation of the condition, and that the upper part of this shield should not be designated a subocular (*vide* Boulenger's Catalogue, Vol. 1, p. 398). On one side in one specimen the 3rd supralabial is also divided as it normally is in the species *ravergieri*. The ventrals vary from 218 to 230, and the subcaudals are 131 in the only specimen where the tail is complete, and these shields can be counted. The costals in all are 19 two headslengths behind the head, 19 in mid-body, and 13 usually (11 once) two headslengths before the anus. The two first steps occur very close together, and are often intermixed but from 19 to 17 the row next to the vertebral usually blends with the one below, and from 17 to 15 above the ventrals blends with the 4th (rarely the 2nd). From 15 to 13 the row next to the vertebral again blends with the one below.

In all a regular series of spots of a darker brown than the ground colour pass down the dorsum. These spots are usually rather large, and roundish or oval, but in some specimens these are replaced by narrow bars.

The teeth in this species are quite different from those of *ventrimaculatus*, the species to which it shows such a very close external resemblance. There is a gap at the back of the maxillary array followed by two enlarged teeth in *ladacensis*.

Zamenis karelini (Brandt).

Several specimens from Quetta, Pishin, Mastung, Walikhan, Gulistan,

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and Bostan. The ventrals range between 192 and 206, and the subcaudals from 92 to 99. The costals number 19 two heads-lengths behind the head, 19 in mid-body, and 13 two heads-lengths before the anus. The absorption of rows from 19 to 17, and from 17 to 15 occurs very close together and the steps may be intermixed. Usually the row next to the vertebral first blends with the one below (or rarely with the vertebral), and then the 3rd blends with the 4th (rarely the 2nd). From 15 to 13 the reduction is similar to that in the first step, the row next to the vertebral disappearing.

The supralabials are usually 9, the 3rd, 4th and 6th being divided, and the 4th, 5th and 6th touch the eye. This seems to me the true interpretation of the condition, and I do not agree with Mr. Boulenger in considering the upper parts of the 4th and 6th shields suboculars. None of these specimens were adorned with any suspicion of an orange vertebral stripe. The dentition is as follows in one :—maxillary 12 left, 11 right, followed by a gap, and then two enlarged teeth. Palatine 8. Pterygoid 15 left, 16 right. Mandibular 16 left, 15 ? right.

Zamenis ravergieri (Ménétr).

Several specimens from Hanna, Quetta, Kalat, Ziarat, and Harboi. This species does not appear to have been recorded from Baluchistan before, and is evidently common there. The supralabials are 9, the 3rd and 4th divided (the 3rd entire in two specimens) and the 4th, 5th and 6th touch the eye. The ventrals range between 195 and 220, and the subcaudals between 87 and 93. In one example the 4th to the 8th are entire and in another the 4th to the 6th. The costals are in 21 rows, two heads-lengths behind the head, 21 in mid-body, and 15 two heads-lengths before the anus. The first two steps from 21 to 19, and 19 to 17 occur close together, and are sometimes intermixed. Usually the row next to the vertebral is absorbed first into the row below, or into the vertebral, then the 3rd row above the ventrals is absorbed into the 4th and finally the rows reduce from 17 to 15 by the row next to the vertebral being absorbed into the one below. In adults the spots are usually rather a darker brown than the ground colour, but in one adult from Ziarat the dorsal spots are unusually black, and well defined. The maxillary teeth agree with those of *rhodorhachis* and *karelini* in having a gap posteriorly succeeded by two enlarged teeth.

Zamenis diadema (Schlegel).

Specimens of this snake are very numerous, there being no less than 30 examples, from Dhadur Bolan, Hirok, Ziarat, Mushkaf, Khushdilkhan, Harboi Hills (Kalat), Fort Sandeman, Kalat, Hudda, Hanna, Quetta, Urak, Kach, Sibi, Mach, Loralai, Sheikh Wasil, Shaltanzai, Pishin and Hazara Road. There are three distinct colour varieties. *A*—Dorsally buff or pale brownish with a few or many scales deep claret coloured.

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There is no arrangement in the disposition of these dark scales, except in one or two specimens where a congeries of such spots roughly suggests the pattern seen in variety *B*. The head is sometimes completely dark claret coloured, or there may be blotches of this hue irregularly disposed above. On the occiput and neck the claret hue merges into a brilliant crimson.

B.—In this the ground colour is light brown. A dorsal series of large spots of a darker brown pass regularly down the middle of the back, and these spots alternate with those of a lateral series of similar but smaller spots. The head is light brown, with a somewhat irregular disposition of darker spots or mottlings, which often form a complete circle on the crown hence the name *diadema*. There is no crimson cephalic or nuchal adornment.

C. This variety may be considered a melanoistic form of the last. The specimens are blackish, with the same arrangement of regular spots as the last variety, the spots being of a still blacker hue. In one specimen no such spots could be distinguished, the colour being uniformly black.

There were many quite juvenile specimens, but it is remarkable that all of these conformed to the type of adults of variety *B*. I have noted this before in the Punjab where adults of variety *A* are very common, and it would appear that the colouration and markings may become very markedly modified with age.

Unlike the preceding three species of this genus the maxillary array of teeth is not interrupted posteriorly, and there are no enlarged posterior teeth, a fact which leads me to think that the genus *Zamenis* as constituted by Mr. Boulenger needs revision and further subdivision.

Lytorhynchus ridgewayi (Boulenger).

Four specimens from Quetta and Bostan. The ventrals are 182, 170, 171 and 172, the anal entire in 3, and dubiously divided in the 4th. The subcaudals are 41, 45, 50 and 51. The costals are normally 19 two heads-lengths behind the head, 19 in mid-body, and 15 two heads-lengths before the anus. In one the 8th and 9th rows above the ventrals repeatedly fused and divided anteriorly so that the rows were 17 in some places. In another the vertebral, and next scale on the left side blended, and divided repeatedly posteriorly so that the rows were 16 in places. The absorption of rows from 19 to 17, and from 17 to 15 occurs close together and the steps may be intermixed, but usually the vertebral row blends with the next first, and then the 3rd and 4th rows above the ventrals coalesce. The supralabials are 7 or 8, and usually the 3rd and 4th are divided, and touch the eye. On one side in one specimen the 4th and 5th are divided and these only touch the eye. In another the 4th only is divided on one side, and the 4th and 5th touch the eye. In all the specimens there was but one loreal not two as mentioned by Mr. Boulenger (Catalogue Vol.

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1, p. 416). The anchor-shaped mark on the head mentioned by Mr. Boulenger was rather disconnected in one specimen.

The dentition is peculiar. There are 8 subequal teeth in the maxillæ, then a gap followed by two ungrooved enlarged teeth. The palatine teeth are 5 in number. There are no pterygoid teeth. The mandible supports 12 on one side, and 11 on the other.

Contia walteri (Boettger).

Two specimens from Quetta and Sharigh are without doubt this species. In both the heads are quite black above, and the body has zebra-like black stripes anteriorly which soon break up into spots, and then disappear posteriorly. The ventrals are 214, and the subcaudals 79 in one example. In the other damage made counting impossible. The anal is divided in both. The scales are 15 two heads-lengths behind the head, 15 in mid-body, and 15 or 13 two heads-lengths before the anus. In the specimen where the rows reduced to 13 the numbers fell owing to a fusion of the 3rd and 4th rows above the ventrals. This was a ♂ example. The loreal was absent in both. The suture between the internasals was subequal to that between the præfrontals in one example, greater in the other. The breadth of the frontal was twice that of the supraocular in one example, and about two-fifths greater in the other. In other respects the specimens agree well with Mr. Boulenger's description (Catalogue Vol. II, p. 264).

Contia mcmahoni. spec. ? nov.

There are four specimens of a little snake of the above genus which I cannot doubt is entitled to rank as a species distinct from any described in Mr. Boulenger's Catalogue, and which I cannot find described elsewhere. These are from Quetta, Loralai, Mach and Spintangi. Three of these are, I presume, adults, and are nearly a foot long, the fourth is a young specimen 6 or 7 inches in length.

Description. Rostral.—touches 6 shields. *Internasals.*—Two, the suture between them equal to or greater than that between the præfrontals. *Præfrontals.*—Two, in contact with internasal, nasal, 2nd supralabial, præocular, supraocular, and frontal. *Frontal.*—Touches 6 shields, the supraocular sutures rather the longest, the breadth fully twice that of the supraoculars. *Nasal.*—Entire. *Loreal.*—Absent. *Præocular.*—One. *Postocular.*—One. *Temporals.*—1 + 1. *Supralabials.*—7, the 3rd and 4th touching the eye. *Infralabials.*—5, the 5th largest, and in contact with 2 scales behind, the 5th only touching the posterior sublinguals. *Costals.*—13 two heads-lengths behind the head, 15 in mid-body, and 13 two heads-lengths before the anus. In all the specimens these scales are 15 in the neck, but soon become 13 by the absorption of the 4th row above the ventrals. After one or two heads-lengths the rows become 15 again by the 3rd row dividing, and remain 15 till the hinder part of the body, where

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they again reduce to 13, the 4th row again blending with the 5th (more rarely the 3rd). The ventrals are 204, 206, 209 and 212, the anal divided and the subcaudals 96, 91, 94, and 96. The body dorsally is nearly uniform light brownish, the scales basally rather darker and the head is of a duskier shade in the adult. In the young the head is black, but not quite so black as in typical *persica* and *walteri*. Under-parts uniform whitish. It seems to be most close to *persica* but differs in the greater number of subcaudals, in having 13 scale rows anteriorly, and in the colour of the adult.

Dipsadomorphus trigonotus (Schneider).

Three specimens from Kirani, Sharigh, and Jhalawan. None of these conform to the variety *melanocephalus* (Annandale, Jour. Asiatic. Soc., Bengal, 1904, p. 209) first mentioned by Dr. Annandale and which appears peculiar to the Perso-Baluchistan area. The ventrals and subcaudals of two are 236 + 80 and 232 + 84.

Psammophis leithi (Günther).

A single specimen from Duki. The scales are 17 two heads-lengths behind the head, 17 in mid-body, and 11 two heads-lengths before the anus. In the step from 17 to 15 the 4th row above the ventrals disappears being absorbed into 3rd on one side, and into the 5th on the other. In the step from 15 to 13 the row next to the vertebral is absorbed, and from 13 to 11 the 3rd row above the ventrals disappears. The ventrals are 172, anal entire, and subcaudals 98. There is a single temporal, and 8 supralabials, the 4th and 5th touching the eye. The belly is uniform saffron-yellow.

Psammophis schokari. (Forskal).

Several specimens from Quetta, Toba, Marachak, Jhalawan, Kishingi, Chaman and Khost.

The specimen from Khost is exactly like specimens of *condanarus* in colouration, there being a median and two lateral narrow stripes of buff, the median involving the vertebral row only, and the lateral the contiguous halves of the 3rd and 4th rows above the ventrals. The specimen from Marachak is very similar, but the buff stripes are broader, the median involving the vertebral, and half the adjacent rows, and the lateral involves the 4th and half the 3rd and 5th rows. The striping is not so well defined and conspicuous as in the previous specimen. The rest have a dark vertebral stripe involving the vertebral, and the adjacent half rows, and there is a series of blackish narrow apical stripes on the scales of the 6th row. There are no light stripes at all anteriorly, but the buff stripes typical of *condanarus* are obscurely indicated posteriorly.

It seems to me very dubious whether all these specimens should be considered *schokari*, I incline to the opinion that there may be two species judging from the peculiarities of the subcaudals, the supralabials, and

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the number of scales in the posterior part of the body as will be seen from the annexed tabulated details.*

Costals.			Ventrals.	Subcaudals.	Labials touching eye.	Habitat.	
2 heads-lengths behind head.	Mid-body.	2 heads-lengths before anus.					
17	17	11	181	121	5th & 6th	Khost.	Baluchistan.
17	17	11	178	117	5th & 6th	Jhalawan.	
17	17	11	179	115	5th & 6th	Toba.	
17	17	13	177	88	?	Chaman.	
17	17	13	182	84	3rd, 4th & 5th	Quetta.	
17	17	13	177	84	4th, 5th & 6th	Quetta.	
17	17	13	186	75	4th, 5th & 6th	Marachak.	

* I append details of other specimens I have examined from other localities for comparison :—

Costals.			Ventrals.	Subcaudals.	Labials touching eye.	Habitat.
2 headslengths behind head.	Mid-body.	2 headslengths before anus.				
17	15	11	180	119	5th & 6th	Muhammerah (Persia).
17	17	11	175	119	5th & 6th	Do.
17	17	11	?	?	4th & 5th	Persian Gulf.
17	17	11	181	149?	5th & 6th	Dthali (Aden Hinter land).
17	17	11	175	124	5th & 6th	Do.
17	17	13?	175	143	?	Do.
17	17	13	172	?	?	Do.

Distira cyanocincta (Daudin).

Six specimens from Soumiani (Las Bela) and Manora. The ventrals of the four critically examined are 348, 363, 366 and 375. The costals are 29, 30, 31 and 32 anteriorly (two headslengths behind the head) 37, 39, 39, and 40 in mid-body, and 37, 38, 39 and 41 posteriorly (two headslengths

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before the anus). There is one postocular on both sides in one example, one on one side in another. The temporal is single on both sides in one specimen, and on one side in two specimens. The body has complete black bands expanding into rhombs dorsally, and not connected ventrally.

Enhydrina valakadyn (Boie).

Two specimens from Soumiana (Las Bela) are quite typical.

Bungarus cæruleus (Schneider).

One typical example from Sharigh, which, as far as I am aware, extends the habitat of this species. The ventrals are 212 but the tail being imperfect the subcaudals cannot be counted.

Bungarus sindanus (Boulenger).

Two specimens from Fort Sandeman. The ventrals are 201 and 214, and the subcaudals 48 in both. I can find no previous mention of this species outside Sind.

The ventrals in these Baluchistan specimens are much lower than the range previously noted by me in my "Poisonous terrestrial snakes of our British Indian Dominions." Within the same week that I examined those specimens I received another from Fort Sandeman through the Secretary of the Bombay Natural History Society, and also details of four others killed this year in the same locality by Major C. H. Ward, of the 4th Rajputs. On revising my previous notes with these additional specimens I find the details noted by me in the above work require some modification. I find for instance that in all the specimens in which I have measured the relative breadth and length of the vertebrals they are as broad or broader than long, not longer than broad, as shown in the plate that accompanies Boulenger's description of one of the type specimens (Bombay Natural History Jour., Vol. XI, p. 73). Again I have stated that some of the terminal subcaudals are divided, and I find that this is very unusual; in fact, is only the case in one of the many specimens I have now seen.

The examination of these recently acquired specimens has broken down many of the distinguishing characters, which at first appeared to differentiate *walli* from *sindanus*, but in spite of this I still think that the two species are distinct. In *walli* the body is very distinctly compressed, but I have never seen any tendency towards compression in *sindanus*. Further the markings in *walli* are distinct, and it appears to be a larger snake than *sindanus*. The record of 14 specimens of *walli* I have examined is 5 feet 4½ inches, whilst that for the 17 specimens of *sindanus* referred to below is 4 feet 3 inches. Mr. Boulenger's quotation from Mr. Mountford that *sindanus* commonly reaches 6 feet is not borne out by these specimens, the details of which I append. The specimens recorded by Mr. Cholmondeley in this Journal (Vol. XVIII, p. 921), and which I considered *walli* (*vide* Vol. XIX, p. 268) must in the light of our increased knowledge I think be acknowledged to be *sindanus*. I await specimens of

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both forms to convert into skull preparations which may throw further light on the subject.

Costals.										
2 heads-lengths behind head.	Mid-body.	2 heads-lengths before anus.	Breadth of vertebrals compared with length.	Ventrals.	Subcaudals.	Subcaudals divided.	2nd supral a b i a l narrower t h a n 3rd.	Body compressed.	Habitat.	Remarks.
17	17	17	*	237	49	None.	*	*	Umarkot (Sind) .	Types in the British Museum.
*	17	17	*	234	52	45th to 49th	*	*	Sukkur (Sind) ..	
17	17	17	*	220	49	None.	*	*	do. ..	
17	17	17	=	218	48	do.	*	*	Jaisulmere (Sind).	Bombay Natural History Society Collection.
17	17	17	¼ >	201	48	do.	No.	No.	Fort Sandeman ..	Quetta Museum Collection.
17	17	17	⅓ >>	214	48	do.	Slightly.	do.	do. ..	
17	17	17	⅓ >	209	43	do.	No.	do.	do. ..	Bombay Natural History Society's Collection.
19	17	17	=	206	48	do.	do.	*	do. ..	Details supplied by Major C. H. Ward.
17	17	17	=	211	47	do.	Slightly.	*	do. ..	
17	17	17	Rather >	216	47	do.	Yes.	*	do. ..	
17	17	17	Do.	207	48	do.	do.	*	do. ..	
17	17	17	Much >	191	45	do.	do.	No.	Indore ..	Specimen sent me by Mr. Cholmondeley.
*	17	*	>	198	44	do. ?	do.	*	do. ..	Specimen referred to by Mr. Cholmondeley in this Journal (Vol. XVIII p. 921.)
*	17	*	>>	189	50	do. ?	Slightly.	*	do. ..	
*	17	*	?	198	48	do. ?	?	*	do. ..	
19	17	17	>	218	?	do. ?	Yes.	*	Jodhpur ..	Details sent me by Major Colan.
19	17	17	>	*	*	*	*	*	Marwar ..	

* Implies not noted.

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Naia tripudians (Merrem).

A single juvenile specimen from Duki. It is pale olive-brown with no suspicion of hood marks, and does not conform to the type of variety *oxiana* (Eichwald). The costals are in 19 rows anteriorly, 21 in midbody, and 13 posteriorly. The ventrals are 189, and the subcaudals 64.

Family.—VIPERIDÆ.

Vipera lebetina (Linné).

Two specimens from Ziarat and Kalat. The ventrals are 170 and 171 and the subcaudals 42 and 46. The costals two heads-lengths behind the head are respectively 22 and 23, in mid-body 23 and 25, and two heads-lengths before the anus 19 in both. They are quite typical.

Echis carinata (Schneider).

Several specimens from Sharigh, Duki, Robat, Hanna, and Quetta. They are all quite typical.

Eristocophis mcmahoni (Alcock and Finn).

One specimen from Kharan lands is quite typical. The costals two heads-lengths behind the head are 23, in mid-body 24, and two heads-lengths before the anus 17. The ventrals are 132, and the subcaudals 32, of which the 2nd to the 6th are entire.

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A SECOND LIST OF MOSSES FROM WESTERN INDIA

BY

L. J. SEDGWICK, I. C. S.

The following list is a continuation of the "First List" published in this Journal for February 1910. As mentioned in that article some of the specimens collected by me at Mahableshwar and Panchgani in January and February 1909 had remained to be determined. Of these several proved to be new, and one small plant from a cave at Panchgani has resulted in the foundation of a new genus MERCEYOPSIS, closely allied to MERCEYA, but differing in the arrangement of the cells in the nerve of the leaf. To this new genus have been assigned the Panchgani moss, and six other species, some new, and some previously included under *Merceya* and other genera. A full account of the genus will be found in an article by Mr. H. N. Dixon, F.L.S., in the Journal of Botany for December 1910. In addition to this *Merceyopsis* Mr. Dixon has described in the same article four new species from Western India, all of which are included in the following list, and marked with an asterisk. This does not conclude the publication of the results of my Mahableshwar collection, a good deal of which, together with some specimens gathered recently at Purandhar Fort, remains to be treated of in a subsequent number of the Journal of Botany.

Since the "First List" was printed I have visited Purandhar Fort twice, and have also received from the Rev. Father Blatter, S.J., the names of a few mosses collected by him in this part of India. I have also, through the courtesy of Mr. W. Burns, B.Sc., Economic Botanist, had the pleasure of seeing a few specimens at Poona collected by Professor C. A. Gammie, mainly at a place named Sakar Pathar, near Lonavla. Dr. Gammie's specimens are mainly duplicates of the commoner species recorded in the "First List." Two, however, one a *Bryum* and the other apparently a *Pylaisia*, are new to me, and have been sent to England for identification.

As one recorded habitat after another comes to light it will gradually become possible to determine the approximate range and distribution of each species. But at present I do not regard the data as sufficient to attempt anything definite. It must be remem-

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bered that the bryology of this part of India had been until quite recently untouched,—how completely so will be apparent when it is said that *Brachymenium turgidum* described for the first time in 1907, is so common that hardly a tree or Euphorbia bush in the ghats from Trimbak to Castle Rock is free of it, while *Hyophila subflaccida*, a new species mentioned below, seems likely to turn out to be the commonest of species, a denizen of every chunamed wall. Progress must necessarily be slow so long as collecting is confined to occasional holidays in the hills on the part of persons whose ordinary work confines them to the plains. What is wanted is a bryologist resident at some suitable place, say, Panchgani. A year's work in such a locality would be productive of literally hundreds of interesting species, many of which would be new.

A few of the species mentioned in the list were also recorded in the "First List," but are mentioned again in order to record a new habitat. I have not thought it worthwhile to do this in the case of the commoner and better known species.

Campylopus Goughii (Mitt), Jaeg.

c. fr., on rotten wood of trees, common, Mahableshwar, 1909, Sedgwick.

* *C. Sedgwickii*, Card. and Dix., spec. nov.

(described in J. of B. for Dec. 1910, p. 303) ster., on the ground in open places, common, Mahableshwar, 1909, Sedgwick.

Pilopogon Blumii (Dz. & Mb.), Broth.

ster., on earth banks, Purandhar, 1910, Sedgwick.

Octobelpharum albidum, Hedw.

on trees, Khandala, 1905, Blatter.

Fissidens zippelianus, Dz. & Mb.

c. fr., on a wall, Poona, 1910, Sedgwick.

* *F. Sedgwickii*, Broth. & Dix., spec. nov.

(described in J. of B., loc. cit., p. 305) ster., on the stones of the stream above Dhobi's waterfall, Mahableshwar, 1909, Sedgwick.

* *Calymperes tortelloides*, Broth. & Dix., spec. nov.

(described loc. cit., p. 306) c. fr., on trees, Mahableshwar, 1909, Sedgwick.

Hymenostomum edentulum (Mitt.), Besch.

c. fr., on banks, Purandhar, 1910, Sedgwick. (Very variable in robustness.)

Hymenostylium xanthocarcum (Hook), Brid.

c. fr., damp ground, Mahableshwar, 1907, Kirtikar; c. fr., on earth banks, Purandhar, 1910, Sedgwick.

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Anæctangium stracheyanum, Mitt.
c. fr., on earth banks, Purandhar, 1910, Sedgwick.

* *Hyophila subflaccida*, Broth. & Dix., spec. nov.
(described in J. of Bot., loc. cit., p. 308) c. fr., on chunamed walls, Andheri, 1908, Kirtikar.

H. stenocarpa, Ren. & Card.
on a basalt rock, Khandala, Blatter.

Gymnostomillum vernicosum (Hook), Fl.
(mentioned in the "First List" under the name of *Pottia vernicosa*, Hampe) on damp rocks, Vehar, 1905, Blatter.

* *Merceyopsis pellucida*, Broth. & Dix., gen. & spec. nov.
(described in J. of Bot., loc. cit., p. 301) on the roof of a cave, and under stone ledges, sterile, Panchgani, 1909, Sedgwick.

Didymodon rufescens (Hook), Broth.
ster., on stones, Purandhar, 1910, Sedgwick.

Barbula comosa, Dz. & Mb.
on rocks, Khandala, 1904, Blatter.

Brachymenium turgidum, Broth.
on trees, Khandala, 1904, Blatter, and on trees and Euphorbia bushes, abundant, Purandhar, 1910, Sedgwick. (I mention this moss again because it was first named *B. pectinidens* by M. Cardot from Father Blatter's specimen, and packets may possibly have been distributed under that name, which has however been withdrawn in favour of *B. turgidum*.)

Orthomnium suberispum (C. M.), ined.
on a tree, ster., Mahableshwar, 1909, Sedgwick.

* *Stereophyllum Blatteri*, Card, spec. nov.
(not known whether yet described) on trees, Khandala, 1904, Blatter on trees, Matheran, Kirtikar.

S. ligulatum (C. M.), Jaeg.
on trees, c. fr., Mahableshwar and Panchgani, 1909, Purandhar, 1910, Sedgwick.

Pterobryopsis Walkeri, Broth.
Khandala, Blatter; Sakar Pathar, Lonavla, Gammie.

Macromitrium ellipticum, Hampe.
on trees, Khandala, 1905, Blatter.

Urocladium alopecuroides, Hook.
on trees, Khandala, Blatter.

Leucoloma sarchotrichum, C. M.
on trees, Khandala, 1905, Blatter.

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THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN "THE FAUNA OF BRITISH INDIA."

SERIES IV, PART II.

By

Sir George F. Hampson, Bart., F.Z.S., F.E.S.

(Continued from page 674 of this Volume.)

Genus Trachea. *Type.*

Trachea, Ochs. Schmett. Eur., iv, p. 75 (1816) non-descr.:
Treit. Schmett. Eur. (5) 2, p. 65 (1825) .. .. *atriplicis.*
Phosphila, Hübn. Verz., p. 208 (1827) .. .. .. *turbulenta.*
Hama, Steph. Ill. Brit. Ent. Haust. iii, p. 4 (1829) .. *anceps.*
Berrhœa, Walk., xv, 1721 (1858) .. .. .. *aurigera.*
Chandata, Moore, Lep. Alk., p. 113 (1882) .. .. *partita.*
Epa, Beth-Baker. Nov. Zool., xiii, p. 192 (1906) .. .. *pratti.*
Achatia, Hübn. Tent. ined .. .. *atriplicis.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons, the 3rd short and blunt; frons smooth; eyes large, round; head and thorax clothed chiefly with scales, the vertex of head with ridge of scales, the pro- and meta-thorax with divided crests; tibiæ fringed with long hair; abdomen with dorsal series of crests. Forewing broad, the apex rounded, the termen crenulate; veins 3 and 5 from close to angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I (*Chandata*).—Antennæ of male bipectinate with long branches, the apex simple.

1760. Trachea partita.

Sect. II.—Antennæ of male bipectinate with short branches, the apex serrate.

1758. Trachea cyanelinea.

Sect. III.—Antennæ of male serrate and fasciculate.

A. Forewing with the subterminal line green; expanding into a patch on inner area .. .. *hastata.*

B. Forewing with the subterminal line not green.

a. Forewing reddish-brown, the orbicular and reniform confluent below .. .. .. *confluens.*

b. Forewing grey irrorated with fuscous and with patches of olive-green, the orbicular and reniform separate .. .. *stoliczcæ.*

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1681. TRACHEA HASTATA.

1753. TRACHEA CONFLUENS.

1731. TRACHEA STOLICZCÆ.

Sect. IV.—Antennæ of male with fasciculate male cilia.

1744. TRACHEA DISTORTA.

Sect. V.—Antennæ of male ciliated.

A. Hindwing of male with the upper part of cell short, the discocellulars oblique, veins 6·7 strongly stalked, their stalk curved upwards and thickened.

1739. TRACHEA STELLIFERA.

B. Hindwing of male with the neuration normal.

a. Forewing of male with the disk clothed with silky downturned hair on underside.

1712*a*. TRACHEA DISTANS, Moore, Lep. Alk., p. 130 (1882).

Head and thorax rufous mixed with some black; palpi black above; tegulæ with slight dark medial line; tarsi blackish ringed with rufous; abdomen pale rufous irrorated with fuscous. Forewing bright rufous irrorated with black, the basal half slightly suffused with fuscous except inner area; subbasal line double, black, waved, from costa to vein 1; antemedial line indistinct, double, waved, bent inwards as a black streak above inner margin; claviform quadrate, defined by black and extending to median nervure, orbicular round, defined by black and with slight whitish annulus; reniform more or less completely filled in with white, with strong black bar on inner side, otherwise slightly defined and with irregular outer edge; a medial black striga from costa; postmedial line double, bent outwards below costa, then waved, oblique to vein 3 near subterminal line then incurved, some pale points beyond it on costa; subterminal line represented by a series of small dentate whitish marks, defined on inner side at middle by small dentate black marks, angled outwards at vein 7 and excurved at middle; a terminal series of small black lunules. Hindwing pale rufous tinged with fuscous brown; a terminal series of black lunules: the underside pale rufous, slightly irrorated with fuscous, a small discoidal spot, slight waved postmedial line and diffused subterminal band.

Habitat.—ASSAM, Khàsis; SINGAPORE; BORNEO. *Exp.* ♂ 34, ♀ 40 mill.

b. Abdomen of male clothed with ferruginous scales except at extremity above; underside of both wings clothed with ferruginous scales to submedian fold and postmedial line.

1712. TRACHEA INDISTANS.

c. Wings of male normal.

a[1]. Forewing with more or less olive or bright green mixed.

a[2]. Forewing with the subterminal line dentate at veins 4·3·2.

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a^3. Forewing with white striga or small spot beyond extremity of claviform.

a^4. Forewing with white apical patch.

a^5. Forewing olive-green mixed with some yellow.. .. .. *albidisca*.

b^5. Forewing rufous slightly tinged with olive and mixed with yellow .. .. *aurantiaca*.

b^4. Forewing without white apical patch.

a^5. Forewing with the orbicular defined at sides by white.

a^6. Forewing with the postmedial line strongly incurved and dentate below vein 4 .. .. *auroviridis*.

b^6. Forewing with the postmedial line much less incurved and dentate below vein 4 .. .. .. *chrysochlora*.

b^5. Forewing with the orbicular large, olive-green, conjoined to the reniform.

a^6. Forewing without terminal series of black lunules .. .. .. *albinota*.

b^6. Forewing with terminal series of black lunules .. .. *olivacea*.

b^3. Forewing with triangular olive-green patch beyond the claviform.

a^4. Forewing without terminal series of black points.. .. .. *venosa*.

b^4. Forewing with terminal series of black points. *literata*.

c^3. Forewing without white or pale patch beyond the claviform.

a^4. Forewing with the reniform white .. .. *monilis*.

b^4. Forewing with the reniform green .. .. *atrovirens*.

b^2. Forewing with the subterminal line dentate at veins 4·3 .. .. *aurigera*.

c^2. Forewing with the subterminal line excurved at middle but not dentate.

a^3. Forewing with white or pale mark beyond the claviform.

a^4. Forewing with oblique white striga beyond the claviform .. .. *microspila*.

b^4. Forewing with wedge-shaped white spot beyond the claviform .. .. *melanospila*.

c^4. Forewing with oblique pale bidentate patch beyond orbicular and claviform .. .. *auriplena*.

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b^3. Forewing without pale mark beyond the claviform .. .. *chlorogrammata.*

b^1. Forewing without olive or bright green mixed.

a^2. Forewing with the reniform not wholly filled in with white.

a^3. Forewing with the postmedial line oblique from below costa to vein 3 near subterminal line.

a^4. Forewing almost entirely suffused with black .. .. *opposita.*

b^4. Forewing red-brown with slight fuscous suffusion .. .. *consummata.*

c^4. Forewing red-brown suffused with purplish grey .. .. *siderifera.*

d^4. Forewing grey-brown without rufous tinge .. .. *connivens.*

b^3. Forewing with the postmedial line excurved or straight from below costa to vein 4, and not approximated to the subterminal line.

a^4. Forewing with the postmedial line minutely dentate below vein 4.

a^5. Forewing with the ante- and postmedial areas concolorous .. .. .. *niveiplaga.*

b^5. Forewing with the ante- and postmedial areas grey-white except towards costa *fasciata.*

b^4. Forewing with the postmedial line evenly curved below vein 4 .. .. .. *secalis.*

b^2. Forewing with the reniform wholly filled in with white .. .. *ascoldis.*

1735*a*. TRACHEA ALBIDISCA.

Hadena albidisca, Moore, P. Z. S., 1867, p. 59, pl. 6, f. 17.

Dianthæcia nivescens, Butl., Ill. Het. B. M., vii, p. 58, pl. 128 f. 2 (1889).

Head and thorax olive-green with a few white scales; palpi whitish, black at sides; sides of frons black; pectus and legs ochreous and whitish; the tarsi banded with black; abdomen brownish, the dorsal crests and anal tuft rufous. Forewing golden olive-green with a bluish tinge before the antemedial line and on veins of medial area; subbasal line white, defined on each side by black, angled inwards in cell and ending at vein 1; a black mark above inner margin before the antemedial line, which is black defined by white on inner side, oblique, angled inwards in cell, on vein 1, and to inner margin, the area beyond it suffused with

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dark brown in and beyond the cell and below the cell and vein 2 to postmedial line; a small triangular white mark from vein 2 marking the extremity of claviform; orbicular blackish defined by some black scales and with slight white spot or bar on its outer edge, open below; a small elliptical white spot in cell before the reniform, which is represented by a diffused white patch extending to vein 2; postmedial line black defined on outer side by white, strongly bent outwards below costa, then dentate and produced to black and white points on the veins, oblique below vein 4 and incurved at vein 2, the costa beyond it black with white points on it; subterminal line white defined on inner side by black marks below costa, then on outer side, dentate and diffused at veins 7, 6; dentate at veins 4, 3, 2, and bent outwards to tornus; a terminal series of small black lunules slightly defined by white on inner side; cilia with a series of black points at tips. Hindwing pale uniformly suffused with fuscous brown, the cilia green mixed with brown towards apex; the underside white irrorated with brown, a black discoidal lunule, curved maculate postmedial line, and diffused subterminal band.

Habitat.—W. China; Punjab, Simla, Dharmsála; Sikhim; Assam, Khásis, Chittagong; Madras, Nilgiris; Travancore, Pirmâd. *Exp.* 32-36 mill.

1738. Trachea aurantiaca.

1735. Trachea auroviridis.

1735*b*. Trachea chrysochlora, Hmpsn., Cat. Lep. Phal. B. M., vii. p. 143, pl. III, f. 10 (1908).

Head and thorax olive-green slightly mixed with whitish and black, palpi whitish, blackish at sides except 3rd joint; sides of frons blackish; patagia rufous at tips; pectus and legs rufous mixed with some fuscous, the tibiæ and tarsi banded with black; abdomen fuscous brown, the dorsal crests and anal tuft rufous. Forewing olive-green tinged with rufous; the subbasal line represented by white striæ from costa and cell defined on each side by black; a black patch above inner margin before the antemedial line, which is double, black filled in with white, oblique angled inwards in cell and on vein 1, and bent inwards to inner margin, the area beyond it in and beyond cell and below the cell and vein 2 to postmedial line suffused with black; a small whitish tooth from near base of vein 2 representing the extremity of claviform; the orbicular conical, rufous defined by a few black scales and with white bar on its outer edge, open below; a slight white lunule concave towards base in cell before the reniform which is small, green, its lower part suffused with purple-grey and white scales; postmedial line black defined by white on outer side, strongly bent outwards below costa, then dentate and produced to black and white streaks on the veins, oblique from vein 5 to 2, then angled outwards again, the costa beyond it black with white

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points on it; subterminal line whitish, defined on inner side by black towards costa, then on outer side, angled outwards at veins 7, 6, 4, 3, 2, and bent outwards to tornus; a terminal series of small black lunules defined on innerside by whitish; cilia with a series of black points at tips. Hindwing pale, wholly suffused with fuscous brown; cilia olive-green mixed with brown towards tips; the underside whitish irrorated with brown: a black discoidal lunule, curved postmedial line and indistinct diffused subterminal band.

Habitat.—PUNJAB, Dharmsála. *Exp.* 34 mill.

1734. TRACHEA ALBINOTA.

1733*a*. TRACHEA OLIVACEA.

Berrhœa olivacea, Moore., P. Z. S., 1881, p. 357. Hmpsn., Cat. Lep. Phal. B. M., vii, p. 144, pl. III, f. 12.

Head and thorax olive-green mixed with red-brown, some of the hairs tipped with white; palpi brown; frons with lateral brown bars; pectus legs and abdomen dark brown; fore tibiæ fringed with green hair, the tarsi with pale rings. Forewing olive-green suffused with reddish brown except on basal and terminal areas, the medial area rather darker, the veins with slight dark streaks irrorated with bluish white: subbasal line represented by double black striæ from costa and cell filled in with green; antemedial line indistinctly double, waved, oblique, angled inwards on vein 1; claviform absent; an oblique greenish-white spot below base of vein 2; orbicular and reniform pale green irrorated with brown and defined by black except below where they are conjoined by a green fascia in and below cell; and indistinct waved medial line; postmedial line slightly defined by greyish on outer side, strongly bent outwards below costa, then minutely dentate, oblique below vein 4, some white points beyond it on costa; subterminal line green, slightly angled outwards at vein 7 and dentate at veins 4, 3, 2, 1, a blackish patch beyond it at discal fold; a terminal series of small black lunules. Hindwing dark reddish brown, the basal inner area rather paler; cilia grey at base and tips; the underside whitish, the costal and terminal areas irrorated and suffused with brown, a discoidal spot, curved postmedial line and diffused subterminal band.

Habitat.—SIKHIM. *Exp.* 36-48 mill.

1752. TRACHEA VENOSA.

1736. TRACHEA LITERATA.

1835. TRACHEA MONILIS.

Ilattia monilis, Moore, P. Z. S., 1881, p. 348, pl. 38, f. 11.

Eurois chalcochlora, Hmpsn., Moths Ind., iv., p. 510 (1896): id. Cat. Lep. Phal. B. M., vii., p. 146, pl. III, f. 15.

1750. TRACHEA ATROVIRENS.

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1733. TRACHEA AURIGERA.

Berrhœa aurigera, Wlk., XV, 1721 (1858); Hmpsn., Cat. Lep. Phal. B. M., vii, p. 148, pl. III, f. 18.

Hadena megastigma, Wlk., XXXIII, 738 (1865).

1735c. TRACHEA MICROSPILA, Hmpsn., Cat Lep. Phal. B. M., vii, p. 149, pl. III, f. 19 (1908).

Head and thorax fuscous brown mixed with some white and black scales and with patches of olive-green on vertex of head, tegulæ, patagia and metathorax; pectus and legs brown irrorated with white, the tarsi with pale rings; abdomen brown irrorated with grey. Forewing grey-brown irrorated with black and some white, the medial area suffused with olive-green; the basal area with patches of green below costa and cell and above inner margin; subbasal line waved, from costa to a slight black spot above vein 1; antemedial line oblique, waved; traces of a claviform defined by black with small oblique white spot beyond its extremity; orbicular and reniform green slightly defined by black and with more or less brown in centres, the former rather elliptical, the latter large, irregular, constricted at middle; a slight waved medial line, oblique from costa to vein 2, then inwardly oblique; postmedial line double at costa, strongly bent outwards below costa, then dentate, very oblique below vein 4, some white points beyond it on costa; subterminal line green, defined on each side by slight black marks and with more or less green suffusion before and beyond it, angled outwards at vein 7, excurved at middle and sharply angled inwards at submedian fold; a terminal series of small black lunules; cilia grey mixed with brown and black. Hindwing with the basal half yellowish-white, the terminal half fuscous, the inner area tinged with brown; cilia whitish with a dark line through them; the underside white, the costal and terminal areas irrorated with brown, a black discoidal spot and curved minutely waved postmedial line with dark band beyond it.

Habitat.—W. CHINA; PUNJAB, Kulu, Sultanpur, Dalhousie, Dharmsála. *Exp.* 50-58 mill.

1732. TRACHEA MELANOSPILA.

Trachea melanosplia, Koll., Hügel's Kashmir, IV, p. 480 (1844); Hmpsn., Cat. Lep. Phal. B. M., vii, p. 149, pl. III, f. 20.

Hadena kosakka, Obuth, Et. Ent., V., p. 80, pl. 7, f. 4 (1880).

1732a. TRACHEA AURIPLENA.

Trachea atriplicis, Koll., Hügel's Kashmir, IV, p. 479 (nec. Linn.).

Eurois auriplena, Wlk., XI, 557 (1857); Moore, Lep. Ceyl. III, p. 37, pl. 148, f. 2.

Hadena lucia,, Butt., A. M. N. H. (5) 1, p. 195 (1878); *id.* Ill. Het. B. M. III, p. 17, pl. 45, f. 2; Stand., Cat. Lep. Phal., p. 184.

Head and tegulæ olive-green mixed with dark-brown, the latter with some white scales; palpi and lower part of frons dark and pale-brown

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thorax fuscous mixed with red-brown and white, the patagia with green fascia; fore tibiæ brown mixed with green, the tarsi with pale rings; abdomen grey-brown, the dorsal crests and anal tuft tinged with rufous. Forewing olive-green irrorated with black, the veins and postmedial area purplish-grey, the costa black; subbasal line waved, from costa to a black and white spot above vein 1: antemedial line defined on innerside by purplish-grey, oblique, minutely waved; claviform absent; orbicular and reniform with black, irrorated brown centres and green annlee, the former elliptical, the latter large, constricted at middle, an oblique purplish-white patch between them from subcostal nervure to submedian fold; postmedial line double at costa, strongly bent outwards below costa, then dentate, oblique below vein 4, some white points beyond it on costa; subterminal line green, expanding into a band on innerside below vein 3 and with green streaks from it to termen between veins 7 and 2, angled outwards at vein 7, excurved at middle and strongly incurved in submedian inter space; a terminal series of small black lunules; cilia green mixed with black. Hindwing with the basal half yellowish-white, the terminal half fuscous, the inner area suffused with brown; cilia yellowish-white with a brown line through them; the underside with the costal area irrorated with black, a discoidal spot and sometimes a streak in cell, the termen grey.

*ab.*1. *lucia*, Hindwing with the basal area more or less tinged with brown.

Habitat.—JAPAN; COREA; W. CHINA; KASHMIR, Scinde Valley; PUNJAB, Kulu, Sultanpur, Dharmsála, Hurripur; SIKHIM; MADRAS, Nilgiris; TRAVANCORE, Pirmàd; CEYLON. *Exp.* 48-54 mill.

1734*b*. TRACHEA CHLOROGRAMMATA.

1716. TRACHEA OPPOSITA.

1713*a*. TRACHEA CONSUMMATA.

Hadena consummata, Wlk., XI., 591 (1857).

„ *confundens*, Wlk., XI., 757 (1857); Moore, Lep. Ceyl., III, p. 38, pl. 148, f. 3.

Mamestra thoracica, Wlk., XV, 1684 (1858).

Hadena inextricata, Wlk., XV, 1729 (1858).

Apamea neurostigma, Snell. Tijd. O. Ent. XXIII, p. 46, pl. 4, f. 4, (1880).

Hadena tulipifera, Saalm. Lèp. Madag., p. 321, pl. xi, f. 195, (1891).

Head and thorax bright rufous with some black and whitish scales; palpi black above; frons with lateral black bars; tarsi black ringed with rufous; abdomen rufous. Forewing bright rufous slightly suffused with brown and irrorated with black; subbasal line double, waved, from costa to submedian fold; antemedial line double, waved, oblique towards inner margin;

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claviform quadrate, defined by black below and at extremity; orbicular and reniform slightly defined by black, the former oblique elliptical, the latter irregular and with some whitish points on outer edge; a medial blackish striga from costa; postmedial line double, bent outwards below costa, then waved, oblique to vein 3 near subterminal line, then incurved, some pale points beyond it on costa; subterminal line represented by a series of small ochreous spots with minute dentate dark marks before them at middle, slightly angled outwards at vein 7; a terminal series of small black lunules; cilia rufous with a punctiform yellowish line at base. Hindwing whitish suffused with red-brown except basal half of costal area; a fine waved black terminal line; cilia whitish tinged with rufous. Underside of forewing whitish tinged with brown except on inner area, the costal area rufous, a dark postmedial line angled outwards below costa and at middle, and diffused subterminal band; hindwing whitish, the costal area suffused with rufous, a black discoidal lunule, irregularly crenulate postmedial line, diffused subterminal band, and terminal series of black lunules.

*ab.*1. Hindwing entirely suffused with fuscous brown; underside of forewing suffused with fuscous leaving the costal area rufous to postmedial line.

*ab.*2. Hindwing of male with the basal half much whiter and with dark postmedial line.

*ab.*3. Forewing without white points on outer edge of reniform.

*ab.*4. Forewing with prominent white spot on outer edge of reniform.

*ab.*5. Forewing with reddish spot on outer edge of reniform.

Habitat.—Br. E. Africa; Transvaal; Natal; Madagascar; Mauritius; Aden; C. China; Punjab, Dharmsàla; Bengal, Barrackpur; Bombay; Madras, Gooty, Nilgiris; Ceylon, Pundaloya, Trincomali; Java; Celebes; Queensland. *Exp.* 38-42 mill.

Larva.—Brownish grey, the 4th and 11th somites humped; subdorsal vesicular black marks on 4th and 5th somites; an irregular dorsal and lateral black band on 4th somite and dorsal patch on 12th somite; stigmata black.

1713*b*. Trachea siderifera.

Hadena siderifera, Moore, P. Z. S., 1881, p. 357; Hmpsn., Cat. Lep. Phal. B. M., vii., p. 202, pl. 113, f. 15.

Head and thorax dark purplish brown with a few white and black scales; palpi blackish above; frons with lateral black bars; tegulæ with traces of dark medial line; tarsi black ringed with rufous; abdomen dark purplish brown. Forewing dark purplish brown; subbasal line double, black, waved, from costa to submedian fold; antemedial line double, black, waved, oblique; claviform large, quadrate, defined by black on outer side and below; orbicular defined by black, oblique elliptical; reniform defined by black on inner side and below, with white spot on outer edge with white points above

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and below it; a waved black medial line, oblique from costa to below cell; postmedial line double, bent outwards below costa, then waved, oblique to vein 3 near subterminal line, then incurved, with slight white points on it at the veins and with pale points beyond it on costa; subterminal line indistinct, ochreous, defined on inner side at middle by small dentate black marks and with small black spots on outer edge, somewhat angled outwards at veins 7·6·4·3; a terminal series of black points; cilia with minute black points at base followed by a dark line. Hindwing deep fuscous brown, the cilia rufous; the underside greyish tinged with rufous and irrorated with brown, a black discoidal spot, sinuous postmedial line and diffused subterminal band.

Habitat.—W. China; Punjab, Kulu, Sultanpur, Simla, Dharmsàla; Sikhim. *Exp.* 44-50 mill.

1713 *a*. Trachea connivens.

Apemea connivens, Feld, Reis. Nov. pl. 109, f. 27 (1874).

Agrotis quadrisigna, Moore, P. Z. S., 1881., p. 350.

„ *placida*, Moore, Lep. Atk., p. 117., pl. 4, f. 19 (1882).

Head and thorax pale brownish grey slightly irrorated with fuscous; palpi blackish above, tegulæ with basal black points at middle and sides; tarsi black with pale rings; abdomen pale brownish grey. Forewing pale brownish grey slightly irrorated with fuscous; subbasal line double, black, waved, from costa to submedian fold; antemedial line double, waved, oblique; claviform short and broad, defined by black except above; orbicular incompletely defined by black, somewhat elliptical; reniform with black bar on inner side and pale rufous or grey spot on outer with slight points above and below it, otherwise undefined; a waved medial dark line, oblique from costa to submedian fold; postmedial line indistinctly double, slightly bent outward below costa, then waved, oblique to vein 3 near subterminal line, then incurved; subterminal line represented by a series of small pale rufous dentate marks, defined on inner side at middle by small dentate black marks and on outer side by black points, somewhat angled outwards at vein 7; a terminal series of black points; cilia with pale rufous line at base. Hindwing whitish tinged with fuscous especially on terminal area; cilia yellowish white; the underside white, the costal area slightly irrorated with brown, a slight discoidal lunule and traces of postmedial and subterminal lines on costal half.

Habitat.—Natal; Cape Colony; Kashmir; Punjab, Kulu, Sultanpur, Simla, Dharmsàla, Dehra Dhun; Bengal, Calcutta. *Exp.* 36-48 mill.

1713. Trachea niveiplaga.

Hadena niveiplaga, Wlk. xi., 593 (1857).

Mamestra terranea, Butl. Ill. Het. B. M. vii., p. 53, pl. 127, f. 10 (1889).

Bombycia hodita, Swinh. A. M. N. H. (6) xv., p. 6 (1895).

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1717 *d*. TRACHEA FASCIATA.

1720. TRACHEA SECALIS.

Noctua secalis, Linn. Syst. Nat. Ed. x., p. 519 (1758); Schiff. Wein. Verz., p. 78 (1776), Bjerkander, Vet. Atk. Handl. xxxix., p. 290 (1778); Staud. Cat. Lep. pal. p. 175.

" *oculea*, Linn. Faun. Succ., p. 321 (1761); Steph. Ill. Brit. Ent. Haust. iii., p. 9; Bell. Ann. Soc. Ent. Fr. 1858, p. 704, pl. 14, f. 3.

" *nictitans*, Esp. Schmett. iv., pl. 126, f. 7 (1788); nec Linn; Hübn. Eur. Schmett. Noct. ff. 97. 619-620.

" *didyma*, Esp. Schmett. iv., pl. 126, f. 7 (1788). Dup. Lèp. Fr. vi., p. 443, pl. 100, ff. 5·6; Frr. Neue Beitr. v., pl. 443, f. 2; Steph. Ill. Brit. Ent. Haust. iii., p. 8.

" *lamda*, View. Tab. Verz. ii., p. 81 (1789).

" *leucostigma*, Esp. Schmett. iv., pl. 159, f. 7 (1791).

Noctua lancea, Esp. Schmett. iv., pl. 174, f. 5 (1791).

" *secalina*, Hübn., Eur. Schmett. Noct. f. 420 (1808).

" *rava*, Haw., Lep. Brit., pp. 137-209 (1809).

" *furca*, Haw. Lep. Brit. p. 209 (1809); Steph. Ill. Brit. Ent. Haust. iii., p. 10.

" *I-niger*, Haw., Lep. Brit. p. 211 (1809); Steph. Ill. Brit. Ent. Haust. iii., p. 10.

" *lugens*, Haw. Lep. Brit. p. 212 (1809).

Parastichtis vilis, Hübn. Verz., p. 213 (1827).

Apamea moderata, Ev. Bull. Mosc. 1843. iii., p. 547 and 1856, iii., p. 56.

Hadena struvei, Ragusa, Nat. Sicil. iv., p. 274, pl. IV., f. 7 (1885).

1717 *c*. TRACHEA ASCOLDIS.

Genus PARATRACHEA. *Type.*

Paratrachea, Hmpsn., Cat. Lep. Phal. B. M. vii., p. 216 (1908) .. .. *laches*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to vertex of head, the 3rd moderate or long and porrect; frons smooth; eyes large, round; antennæ ciliated; head and thorax clothed with hair and hair-like scales, the pro- and metathorax with divided crests; tibiæ fringed with hair; abdomen with series of dorsal crests and some rough hair at base. Forewing rather narrow, the apex rounded, the termen evenly curved, crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of

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discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1730. PARATRACHEA CHALYBEATA.

Nænia chalybeata, Moore, P. Z. S. 1867, p. 64, Hmpsn. Cat. Lep. Phal. B. M. vii., p. 217, pl. 113, f. 25.

Hadena spectabilis, Pouj. Bull. Soc. Ent. Fr. 1887, p. cx.

Genus EUPLEXIA.	*Type.*
Euplexia, Steph., Ill. Brit. Ent. Haust., III, p. 3 (1829) ..	*lucipara.*
Karana, Moore, Lep., Atk., p. 106 (1882)	*decorata.*
Yula, Beth., Baker., Nov. Zool. XIII, p. 193 (1906) ..	*novæguineæ.*
Sect. I. Antennæ of male bipectinate with moderate branches, the apex simple.	
A. Forewing with the antemedial band strongly angled outwards below median nervure	*sinuata.*
B. Forewing with the antemedial band not angled outwards below median nervure	*pectinata.*

1743*a*. EUPLEXIA SINUATA.

Euplexia sinuata, Moore, Lep. Atk., p. 125, pl. 4, f. 25 (1882).

♂. Head and thorax purplish-black; antennæ with tufts of white hair from basal joint; tarsi ringed with white; abdomen fuscous, whitish at base. Forewing purplish fuscous, the basal area with some rufous below the cell: subbasal line represented by a whitish striga from costa and hoop-shaped mark on a black patch below the cell confluent with another black mark on inner margin; a white antemedial band tinged with brown towards costa, strongly angled outwards below the cell and above inner margin and inwards on vein 1; orbicular quadrate, defined slightly by white at sides only and with black before it in cell and between it and reniform, which is fuscous defined by whitish and with some whitish in centre, angled inwards on median nervure to the orbicular; the medial area below the cell black, rufous at inner margin; the postmedial area whitish tinged with rufous and pale brown; the postmedial line obsolescent and defined by white on outer side, obliquely bent outwards from below costa to vein 6, below vein 5 incurved to lower angle of cell, then oblique, slightly angled outwards at vein 2 and to inner margin, the costa beyond it black with white points; subterminal line indistinct, pale, slightly waved, defined on inner side by black from below costa to submedian fold, the area beyond it purplish fuscous to vein 4, then greyish; cilia black with brownish line at base. Hindwing whitish tinged with fuscous, the costal and terminal areas broadly suffused with fuscous; indistinct postmedial and subterminal lines defined on outer side by whitish below vein 3 and with some blackish before them at vein 2; cilia blackish with a fine white line at base, pale towards tornus: the underside white, the costal and terminal areas irrorated with fuscous, a small discoidal lunule and diffused postmedial and subterminal lines.

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Habitat.—SIKHIM. *Exp.* 34 mill.

1759. EUPLEXIA PECTINATA.

Sect. II. Antennæ of male ciliated.

A. Forewing ochreous white with the terminal area leaden grey. .. .. *plumbeomarginata.*

B. Forewing not ochreous white with the terminal area leaden grey.

a. Forewing with white band before the antemedial line.

a^1. Forewing with the antemedial white band angled inwards in submedian fold.

a^2. Forewing without purplish band from costa before the reniform .. .. *albovittata.*

b^2. Forewing with purplish band from costa before the reniform .. .. *fasciata.*

b^1. Forewing with the antemedial band not angled inwards in submedian fold.

a^2. Forewing suffused with silvery metallic green and golden bronze.

a^3. Hindwing wholly suffused with fuscous brown. *decorata.*

b^3. Hindwing white, the terminal area suffused with brown .. .. *gemmifera.*

b^2. Forewing not suffused with silvery metallic green and golden bronze

a^3. Forewing with the claviform with white annulus defined by black .. .. *calamistrata*

b^3. Forewing with the claviform represented by a black point .. .. *chlorerythra.*

b. Forewing without white band before the antemedial line.

a^1. Forewing with pale patch on reniform.

a^2. Forewing with the inner margin pale green on medial area.

a^3. Forewing with oblique brown line between veins 7 and 4 beyond the postmedial line which is excurved well beyond the reniform .. .. *discisignata.*

b^3. Forewing without oblique brown line between veins 7 and 4 beyond the postmedial line which is closely approximated to the reniform .. *striatovirens.*

b^2. Forewing with the inner margin not green on medial area.

a^3. Forewing with the postmedial area paler than the terminal area.

a^4. Forewing with the postmedial line formed by three ochreous lines .. .. .. *plumbeola.*

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b^4. Forewing with the postmedial line not formed by three ochreous lines.

a^5. Forewing with the postmedial area greyish or purplish without rufous tinge.

a^6. Forewing with the postmedial line not angled outwards at vein 2 .. .. *albimota.*

b^6. Forewing with the postmedial line angled outwards at vein 2 .. .. .. *poliochroa.*

b^5. Forewing with the postmedial area strongly suffused with rufous .. .. *semifascia.*

b^3. Forewing with the postmedial and terminal areas concolorous .. .. *melanistis.*

Forewing without pale patch on reniform.

a^2. Forewing with small white lunule on outer edge of reniform.

a^3. Forewing red-brown largely mixed with grey...*magniclavis.*

b^3. Forewing dark brown with a purplish grey gloss.

a^4. Forewing with the orbicular and reniform not connected by a fascia on median nervure .. ..*metallica.*

b^4. Forewing with the orbicular and reniform connected by a fascia on median nervure...*harfordi.*

b^2. Forewing without white lunule on outer edge of reniform .. ..*erythriris.*

1743*a*. EUPLEXIA PLUMBEOMARGINATA.

1743. EUPLEXIA ALBOVITTATA.

1743*b*. EUPLEXIA FASCIATA.

Euplexia fasciata, Hmpsn., Ill. Het., B. M. viii, p. 77 pl., 145, f. 20 (1891).

♀. Head and thorax black mixed with some white; antennæ ringed with white and with tufts of white hair from basal joint; tibiæ and tarsi ringed with white; abdomen fuscous, the ventral surface black irrorated with white. Forewing purplish fuscous; some pinkish at base and below costa near base; a black spot above vein 1 before the antemedial band, defined on inner side by a white striga representing the subbasal line; and above by a white fascia connected with the white antemedial band from subcostal nervure to inner margin, angled inwards on median nervure and above inner margin; orbicular quadrate, fuscous defined by white at sides only and with black before and beyond it in cell; reniform white with slight fuscous spot in upper part, confluent below with the white post-medial area and emitting a slight white streak on median nervure to the orbicular; the medial area black below the cell and pale reddish at inner

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margin; a purplish fuscous band beyond the reniform, the area beyond it white to the subterminal line, below vein 4 bent inwards to lower edge of reniform; postmedial line very indistinct, formed of black scales bent outwards below costa, then double, minutely waved, below vein 4 bent inwards to lower angle of cell, then oblique, the costa beyond it black with some white points; subterminal line slight, white defined on inner side by black between veins 7 and 2, waved, more strongly below vein 4, the area beyond it purplish fuscous on apical half, pale brownish on inner half; a terminal series of slight black lunules; cilia white at base, black at tips. Hindwing fuscous black, some whitish at base, a small postmedial white spot on vein 2 with some black on each side of it and a wedge-shaped white patch on termen from above vein 2 to vein 1; cilia white at base, black at tips, the underside black-brown irrorated with white, some white below the cell, a white discoidal spot and traces of diffused black postmedial and subterminal lines.

Habitat.—MADRAS, Nilgiris. *Exp.* 42, mill.

1743c. EUPLEXIA DECORATA.

Karana decorata, Moore, Lep. Atk, p. 107 (1882); Hmpsn. Cat. Lep. Phal. B. M. vii, p. 228, pl. 113, f. 30.

Head white mixed with black; palpi black with some white in front and at tips; antennæ black; thorax black-brown mixed with red-brown and white, the patagia with curved golden-green marks; pectus and legs black-brown irrorated with white, the tibiæ with some rufous hair above, the tarsi ringed with white; abdomen black-brown irrorated with white, the crests red-brown. Forewing black irrorated with white and with patches and streaks of golden-green, the veins purplish grey, the medial area with reddish streaks below subcostal nervure and vein 7, on median nervure and between veins 4 and 2, and above vein 1; a silvery white subbasal band, from costa to vein 1, expanding into slight streaks in and below cell; a white antemedial band, nearly straight from costa to above inner margin, then bent inwards, emitting an oblique streak on inner side above vein 1; claviform represented by a white lunule on a black patch: orbicular a small round white spot defined by black; reniform white with two small round black spots in its upper part, its brown edge excised, a white spot above it on costa; an indistinct medial line, oblique from costa to lower angle of cell, then inwardly oblique; postmedial line indistinct, strongly bent outwards below costa, then dentate, incurved below vein 7 and oblique below vein 4, some white points beyond it on costa; subterminal line very indistinct, formed of yellowish white striæ and small spots below veins 7 and 5 with obscure blackish spots on their inner side; a terminal series of small black spots; cilia black and white with fine white line at base. Hindwing black-brown with indistinct sinuous postmedial line, some white on termen below vein 2; cilia brown and white with white patch at

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sub-median interspace; the underside black-brown thickly irrorated with white, the inner area slightly whitish, a black discoidal spot defined by white, diffused crenulate postmedial line, and traces of subterminal line.

Habitat.—SIKHIM. *Exp.* 40-46 mill.

1742. EUPLEXIA GEMMIFERA.

Plusia gemmifera, Wlk. xii. 934 (1857).

Karana similis, Moore, P. Z. S., 1888, p. 407; Butl. Ill. Het. B. M. vii., p. 60, pl. 128, f. 8.

1737. EUPLEXIA CALAMISTRATA.

1741*a*. EUPLEXIA CHLORERYTHRA.

1728. EUPLEXIA DISCISIGNATA.

1728*a*. EUPLEXIA STRIATOVIRENS.

Euplexia striatovirens, Moore, P. Z. S., 1867, p. 58; Hmpsn., Cat. Lep. Phal. B. M. vii., p. 233, pl. 114, f. 1.

Head and thorax purplish fuscous slightly mixed with grey, the metathoracic crest whitish; tarsi with slight pale rings; abdomen whitish suffused with brown. Forewing purple-brown; subbasal line black defined on each side by green, waved, from costa to vein 1; antemedial line defined by green on inner side, angled outwards below costa, then curved; medial area with the cell and area below it to submedian fold dark brown, the inner area green irrorated with brown; claviform and orbicular purplish fuscous slightly defined by grey and black, both confluent with a similar spot below the cell; reniform white, defined by black on inner side only, its centre defined by dark brown spots, rather oblique elliptical, the area beyond it greenish to the postmedial line which is double filled in with greenish, slightly bent outwards below costa to just beyond the cell, incurved at discal fold, incurved and sinuous below vein 4; subterminal line slight, greenish, slightly defined on each side by blackish, somewhat excurved below vein 7 and at middle; cilia with a fine pale line at base. Hindwing whitish suffused with fuscous brown except the inner area, in female wholly suffused; traces of a sinuous postmedial line with a blackish and white striga at vein 2; a white subterminal line from above vein 2 to tornus; cilia with a fine pale line at base; the underside white, the costal area suffused with brown, a small discoidal spot and indistinct postmedial and subterminal lines.

Habitat.—SIKHIM. *Exp.* 32-34 mill.

1741. EUPLEXIA PLUMBEOLA.

1729. EUPLEXIA ALBONOTA.

1729*a*. EUPLEXIA POLIOCHROA.

Euplexia poliochroa, Hmpsn., Cat. Lep. Phal. B. M. vii., p. 237, pl. 114, f. 5 (1908).

♀. Head and thorax grey mixed with reddish brown; tegulæ with ochreous patches; tarsi blackish with whitish rings; abdomen grey mixed

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with brown. Forewing violaceous grey tinged with brown, the medial area, suffused with brown except towards costa; subbasal line double, black angled outwards on median nervure, from costa to vein 1, and with slight streak beyond it in submedian fold; antemedial line indistinctly treble, curved and somewhat waved; claviform minute, defined by black; orbicular grey defined by black at sides only, oblique elliptical; reniform grey with some whitish at centre and whitish annulus defined by black on inner side only; postmedial line double at costa, bent outwards below costa, then treble, oblique below vein 4 and angled outwards at vein 2; subterminal line indistinct, greyish, slightly defined on each side by fuscous brown and very minutely dentate; a terminal series of slight dark lunules; cilia with a fine white line at base. Hindwing grey suffused with brown; traces of a minutely waved dark postmedial line defined by whitish on outer side; a fine white line at base of cilia; the underside whitish tinged and irrorated with brown, a black discoidal spot, sinuous postmedial line and traces of subterminal line.

Habitat.—MADRAS, Nilgiris. *Exp.* 34 mill.

1726. EUPLEXIA SEMIFASCIA.

1726*a*. EUPLEXIA MELANISTIS.

Euplexia melanistis, Hmpsn., Cat. Lep. Phal. B. M., vii, p. 243, pl. 114, f. 9 (1908).

Head and thorax black, the scales tipped with grey; tarsi ringed with white; abdomen black-brown mixed with grey. Forewing black-brown tinged with purple and irrorated with white; subbasal line represented by double black striæ from costa and cell and one in cell; antemedial line indistinct, double, oblique, slightly waved; claviform slightly defined by black; orbicular rounded, defined by black except above, and connected with a spot below the cell; reniform rather narrow and slightly produced at upper extremity, slightly defined by white and with pale yellow marks at middle on inner and outer sides; postmedial line indistinct, double at costa, bent outwards below costa, at vein 4 bent inwards and obliquely waved to inner margin, some white points beyond it on costa; subterminal line represented by a series of black marks in the interspaces; cilia with a pale punctiform line at base. Hindwing black-brown, with a white postmedial point on vein 2 and subterminal points on veins 3 and 2; cilia with a slight pale line at base and whitish tips; the underside irrorated with white, a blackish discoidal lunule, curved postmedial line: and diffused subterminal line.

Habitat.—MADRAS, Palni Hills, 7,000. *Exp.* 30 mill.

1804*a*. EUPLEXIA MAGNICLAVIS.

1727. EUPLEXIA METALLICA.

1766. EUPLEXIA HARFORDI.

1727*a*. EUPLEXIA ERYTHRIRIS.

Euplexia erythriris, Hmpsn., Cat. Lep. Phal. B. M., vii, p. 246, pl. 114, f. 15 (1908).

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♂. Head and thorax black-brown, the scales slightly tipped with grey; legs irrorated with white; abdomen fuscous brown. Forewing black-brown irrorated with purple and grey, the medial area darker except towards costa, the inner margin with red streak; traces of a double waved subbasal line from costa to submedian fold; antemedial line indistinct, double, oblique, waved; claviform indistinctly defined by blackish; orbicular and reniform with red annuli defined by black, the former oblique elliptical, the latter rather narrow and angled inwards on median nervure below orbicular to the antemedial line; a very indistinct waved medial line oblique from costa to below cell; postmedial line double, bent outwards below costa, then minutely dentate, excurved to vein 4, then oblique, some white points beyond it on costa; subterminal line reddish, defined on inner side by black-brown patches in the interspaces, slightly angled outwards at vein 7 and incurved below vein 3, with slight black streaks beyond it in the interspaces to the terminal lunules; cilia black-brown with slight pale line at base. Hindwing dark brown with traces of a pale subterminal band except towards costa and inner margin; cilia with whitish line at base and whitish tips; the underside greyish brown with traces of discoidal lunule, curved postmedial line and diffused subterminal band.

Habitat.—ASSAM, Khàsis. *Exp.* 50 mill.

Genus, ANCARA.

	Type.
Ancara, Wlk., xv, 1714 (1858)	*replicans.*

Sect. I.—Antennæ of male bipectinate with long branches to three-fourths length, of female with short branches.

A. Forewing deep purplish red-brown suffused with violaceous grey .. .. *obliterans.*

B. Forewing ochreous more or less completely suffused with olive-fuscous .. .. *anæmica.*

1763. ANCARA OBLITERANS.

1763*a*. ANCARA ANÆMICA.

Ancara anæmica, Hmpsn., Cat. Lep. Phal. B. M., vii, p. 253, pl. 114, f. 23 (1908).

♂. Head and thorax ochreous tinged with rufous and mixed with some fuscous; tegulæ with slight dark medial line; pectus, legs and abdomen ochreous, the legs slightly tinged with pink. Forewing ochreous, irrorated and in parts suffused with olive fuscous, the base of inner area and a patch beyond the reniform tinged with rufous; antemedial line double and minutely dentate at costa, then single, angled inwards on vein 1 and outwards above inner margin; claviform represented by a blackish patch with an ochreous patch beyond it; orbicular and reniform faintly defined by blackish, the former ochreous and conjoined to the patch below cell, the latter narrow

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with some olive in centre and slight pale annulus; a dark medial line, oblique from costa to vein 2, then inwardly oblique and somewhat dentate; postmedial line blackish, double towards costa, bent outwards below costa, then dentate, excurved to vein 4, then oblique; subterminal line dark, dentate, angled outwards at veins 4·3 and inwards at discal and submedian folds, with a dark streak beyond it above vein 3; a terminal series of small black lunules; cilia reddish brown. Hindwing ochreous tinged with pinkish and irrorated with fuscous, the terminal area suffused with fuscous, the termen and cilia ochreous; the underside ochreous, the terminal area slightly irrorated with black, a black discoidal spot and curved pinkish postmedial line.

♀. Head and thorax suffused with olive fuscous; abdomen tinged with brown; forewing with the ground colour olive fuscous, the markings indistinct; hindwing wholly suffused with fuscous brown.

Habitat.—Ceylon, Haldamulla, Hambantota. *Exp.* ♂ 42, ♀ 44 mill.

Sect. II.—Antennæ of male ciliated.

A. Forewing with the ground-colour violaceous grey. *glaucochlora.*

B. Forewing with the ground-colour red-brown .. *viridipicta.*

1770. Ancara glaucochlora.

1770*a*. Ancara viridipicta.

Genus, Arboricornis.

1853. Arboricornis rubra.

Genus, Corythurus.

1824. Corythurus nocturna.

Genus, Oligia.

	Type.
Oligia, Hübn. Verz., p. 213 (1827)	.. *strigilis.*
Miana, Steph., Ill. Brit. Ent. Haust., iii, p. 11 (1829)	.. *literosa.*
Photedes, Led. Noct. Eur., pp. 44 and 189 (1857) ..	.. *captiuncula.*

Proboscis fully developed; palpi upturned, the second joint reaching about to middle of frons and fringed with hair in front, the third short, blunt, naked; frons smooth; eyes large, round; antennæ of male ciliated; head and thorax clothed chiefly with scales, the pro- and metathorax with spreading crests; tibiæ moderately fringed with hair; abdomen with dorsal crests on basal segments. Forewing triangular, the apex rounded, the termen evenly curved; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomising with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I.—Forewing of male with fan of large scales in cell on underside.

A. Forewing with the orbicular and reniform confluent on median nervure .. .. *ptyophora.*

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B. Forewing with the orbicular and reniform not confluent on median nervure .. .. .. *nadgani*.

1979*a*. OLIGIA PTYOPHORA.

Oligia ptyophora, Hmpsn. Ill. Het. B. M., vii, p. 363 (1908).

Head and thorax greyish mixed with brown and black; tarsi black ringed with grey; abdomen grey mixed with fuscous, the crests black. Forewing red-brown tinged with grey and suffused with fuscous on basal inner and terminal areas; subbasal line represented by black striæ from costa and cell; antemedial line formed of black striæ, somewhat oblique, waved and with short black streaks before it in cell, submedian fold and above inner margin; orbicular and reniform pale brownish incompletely defined by black and open above, the former with slight dark centre, oblique elliptical, the latter with fuscous centre, extending to well below the cell, angled inwards in median nervure and slightly confluent with the former; a black bar from middle of costa and traces of a waved line on inner area; postmedial line black, slightly bent outwards below costa, then minutely waved, strongly excurved to vein 4, then oblique to submedian fold, some slight points beyond it on costa; subterminal line represented by a sinuous grey band from costa to vein 6, spot at middle and oblique striga at tornus; a terminal series of black striæ; cilia blackish. Hindwing whitish suffused with brown except on costal area; cilia white mixed with grey, with white line at base followed by a dark line; the underside ochreous white irrorated with fuscous, a fuscous discoidal spot, curved minutely waved postmedial line, and a terminal series of slight black lunules.

ab. 1. Forewing with patch of white suffusion in and below cell.

Habitat.—PUNJAB, Simla, Dalhousie; SIKHIM, 1,800. *Exp*. 24-28 mill.

1979. OLIGIA NADGANI.

Sect. II.—Forewing of male normal.

A. Forewing with the subterminal line distinctly dentate.

a. Forewing violaceous grey suffused with dark-brown *vermiculata*.

b. Forewing ochreous suffused with red-brown.

a'. Forewing with the postmedial line slightly incurved below vein 4 and widely separated from the lower extremity of reniform .. *pallidisca*.

b'. Forewing with the postmedial line strongly incurved below vein 4 and approximated to the lower extremity of reniform .. .. *gaucostigma*.

B. Forewing with the subterminal line excurved at middle and not dentate.

a. Forewing with the postmedial line slightly incurved below vein 4 and widely separated from the lower extremity of reniform .. *chasiana*.

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b. Forewing with the postmedial line strongly incurved below vein 4 and approximated to the lower extremity of reniform .. .. *albirivula*.

1984. OLIGIA VERMICULATA.

Erastria vermiculata, Snell. Tijd., v, Ent., xxiii, p. 85, pl. v, f. 3 (1880).

Daxata glaucescens, Butl. Ill. Het. B. M., vii, p. 81, pl. 133, f. 4 (1889).

Anophia undara, Swinh. Trans. Ent. Soc., 1890, p. 234.

1083. OLIGIA PALLIDISCA.

1985. OLIGIA GLAUCOSTIGMA.

1981. OLIGIA CHASIANA.

Bryophila khasiana, Hmpsn. Moths Ind., ii, p. 299 (1894); id., Cat. Lep. Phal. B. M., vii, p. 373, pl. 117, f. 20.

„ *obliquifascia*, Hmpsn., Trans. Ent. Soc. 1895, p. 299; id., Moths Ind. iv, p. 513.

Euplexia repetita, Swinh. A. M. N. H. (7), xv, p. 499 (nec. Butl.).

1981*a*. OLIGIA ALBIRIVULA.

Oligia albirivula, Hmpsn. Cat. Lep. Phal. B. M., vii, p. 375, pl. 117, f. 21 (1908).

♀. Head and thorax whitish mixed with bright rufous; palpi bright rufous; frons with dark lateral bars; tarsi fuscous ringed with whitish; abdomen grey tinged with rufous. Forewing with the inner and postmedial areas, except at costa, white, the basal costal area, the medial area to submedian fold, and terminal area bright rufous; subbasal line double, waved, from costa to submedial fold, with a slight blackish streak beyond it above vein 1; antemedial line double, angled outwards below costa incurved in cell, then strongly excurved and slightly angled inwards on vein 1; claviform defined by brown, extending to median nervure; orbicular with slight ochreous annulus defined by brown, elongate elliptical; reniform defined by brown, with whitish centre defined by brown and yellowish annulus on inner side, whitish on outer, somewhat angled inwards on median nervure; postmedial line double, bent outwards below costa, incurved at discal fold and strongly below vein 4, some whitish points beyond it on costa; subterminal line defined by a rufous shade on inner side, angled outwards at vein 7 to termen and excurved at middle; the terminal area with dark patches at middle and above tornus; a terminal series of black lunules; cilia rufous mixed with black towards tornus and with series of black spots at tips. Hindwing whitish tinged with brown; a terminal series of dark striæ; the underside whitish irrorated with brown, a slight dark discoidal spot, curved postmedial line and terminal series of striæ.

Habitat.—ASSAM, Khâsis. *Exp*. 30 mill.

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Genus, AGROPERINA.

Type.

Agroperina, Hmpsn., Cat. Lep. Phal. B. M., vii, p. 398 (1908).. *lateritia*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and fringed with hair in front, the 3rd short, porrect; frons smooth; eyes large, round; antennæ of male ciliated; head and thorax clothed with hair and hair-like scales, the latter with indistinctly double ridge-like dorsal crest; tibiæ moderately fringed with hair; abdomen with dorsal crests on basal segments, some rough hair at base, and lateral fringes of hair. Forewing rather narrow, the apex rectangular, the termen obliquely curved and slightly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle, 8 anastomosing with the cell near base only.

1710*a*. AGROPERINA LATERITIA.

Phalæna lateritia, Hüfn. Berl. Mag., iii, p. 306 (1767); Esp. Schmett., iv, pl. 131, ff. 3·4; Dup. Lép. Fr. vii, p. 208, pl. 113, f. 5; Frr. Neue Beitr. i, pl. 65; Smith, Cat. Noct. N. Am., p. 134; Staud, Cat. Lep. pal. p. 173.

Noctua molochina, Hübn. Eur. Schmett. Noct., f. 74 (1802).

Mamestra obliviosa, Wlk., xv, 1683 (1858).

Hadena expallescens, Staud. Stett. Ent. Zeit. 1882, p. 41.

Hadena satina, Streck, Lep. Rhop. and Het. Suppl., i, p. 8 (1898); Dyar, Cat. Lep. N. Am., p. 115.

Hadena borealis. Strand, Arch. Naturv. Christian, xxv, 9, p. 13 (1903).

Head and thorax dark purplish red; palpi and frons at sides dark brown; pectus with the hair pale; tarsi dark brown ringed with whitish; abdomen ochreous or reddish brown, greyish at base. Forewing purplish red brown with slight dark irroration, the costal area rather browner, the veins irrorated with some white scales; subbasal line indistinct, waved, from costa to submedian fold; antemedial line double at costa, oblique to submedian fold, angled inwards to a dark point on vein 1, and bent inwards to inner margin; claviform absent; orbicular and reniform narrow with dark brown centres and incomplete white annuli, the former oblique elliptical; a dark medial shade, oblique from costa to vein 2, then incurved; postmedial line double and filled in with whitish at costa, bent outwards below costa, then dentate and produced to black and white points on the veins, excurved to vein 4, then oblique, some white points beyond it on costa; subterminal line indistinct, pale, slightly defined on inner side by brown, angled outwards at vein 7 and dentate at veins 4·3; a terminal series of small black lunules. Hindwing pale suffused with ochreous brown, the

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veins and terminal area darker; cilia ochreous; the underside ochreous white, the costal and terminal areas tinged with purplish and irrorated with brown, a dark discoidal point and curved postmedial line with minute dark streaks on the veins.

ab. 1. *borealis.*—Darker and browner. Lapland.

ab. 2.—Pale purplish red.

ab. 3. *expallescens.*—Forewing ochreous suffused with pale red except on inner and postmedial areas, the terminal area tinged with brown. W. and E. Turkistan; Tibet.

Habitat.—CANADA, U. S. A.; EUROPE; ARMENIA; W. TURKISTAN; E. TURKISTAN; TIBET; MONGOLIA; E. SIBERIA; JAPAN; KASHMIR, Goorais Valley, Nubra. *Exp.* 46-54 mill.

Larva, Kirby, Butt. and Moths Eur., p. 240; Hffm. Raup., p. 97, pl. 27, f. 14.

Dark-grey with the thoracic and anal plates black; head brown. Food plants, Grasses, 4.

Genus RHYNCHOPLEXIA.

Type.

Rhynchoplexia, Hmpsn., Cat. Lep. Phal. B. M., vii, p. 433 (1908) . . *rubra.*

Proboscis fully developed; palpi obliquely upturned, the 2nd joint fringed with long hair in front, the 3rd long, naked, porrect; frons smooth, with tuft of hair; eyes large, round; antennæ of male ciliated; head and thorax clothed with hair and hair-like scales, the pro- and metathorax with spreading crests; tibiæ fringed with hair; abdomen with dorsal crest at base only. Forewing with the termen crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing purplish red, the reniform defined by white marks on outer side . . . . . *rubra.*

B. Forewing fuscous brown, the reniform not defined by white marks on outer side . . . . . *griseimarginata.*

1767. RHYNCHOPLEXIA RUBRA.

1779. RHYNCHOPLEXIA GRISEIMARGINATA.

Genus LASIPLEXIA.

Type.

Lasiplexia, Hmpsn., Cat. Lep. Phal., B. M. vii, p. 483 (1908) . . *cuprina.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching to about middle of frons and fringed with long hair in front, the 3rd moderate porrect; frons smooth, with large tuft of hair; eyes large, round; vertex of head with crest; thorax clothed with hair only, the pro- and metathorax

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with spreading crests; tibiæ moderately fringed with hair: abdomen with some rough hair at base and basal crest only. Forewing with the apex rounded, the termen evenly curved and slightly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle: 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male bipectinate with rather short branches, the apex serrate.

1693. LASIPLEXIA CUPRINA.

Apamea cuprina, Moore, P. Z. S., 1881, p. 345, pl. 38, f. 2.

Eurois chalybeata, Hmpsn., Moths. Ind., ii, p. 230 (nec. Wlk.).

Sect. II.—Antennæ of male ciliated.

A. Forewing with white or pale spots on outer edge of reniform .. .. .. *chalybeata.*

B. Forewing without white or pale spots on outer edge of reniform.

a. Forewing red brown suffused with purplish-grey .. .. *nubila.*

b. Forewing black brown irrorated with silvery blue .. .. *cyanea.*

1783*a*. LASIPLEXIA CHALYBEATA.

1729*a*. LASIPLEXIA NUBILA.

1783*b*. LASIPLEXIA CYANEA.

Lasiplexia cyanea, Hmpsn., Cat. Lep. Phal. B. M. vii., p. 486, pl. 119, f. 32 (1908).

♀. Head and thorax very dark brown, the head rather more rufous: tarsi ringed with whitish; abdomen grey brown. Forewing very dark brown with a reddish tinge, irrorated with some silvery blue scales especially on medial area and termen; subbasal line represented by a semi-circular silvery blue mark below costa; antemedial line indistinct, dark, defined on inner side by silvery blue, angled outwards below costa, incurved in cell, then excurved; claviform slightly defined by silvery blue at extremity: orbicular irrorated with silvery blue and defined by black, oblique elliptical reniform indistinct, slightly irrorated with blue, defined by black and its centre also defined by black, a greyish lunule on its outer edge; traces of a curved dark medial line: postmedial line indistinct, dark, defined on outer side by silvery blue towards costa and inner margin, bent outwards below costa, then minutely waved, excurved to vein 4, then incurved, some white points beyond it on costa; subterminal line silvery blue, excurved at vein 7, slightly angled outwards at veins 4·3 and inwards at submedian fold; a terminal series of small black lunules; cilia dark brown at base, yellowish brown at tips. Hindwing deep fuscous brown: cilia yellowish with a dark

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line through them; the underside yellowish tinged with brown and broadly suffused with brown on costal and terminal areas, a curved postmedial line.

Habitat.—ASSAM, Khásis. *Exp.* 46 mill.

Genus TRIGONOPHORA.	*Type.*
Trigonophora, Hübn. Verz., p. 217 (1827)	*meticulosa.*
Solenoptera, Herr. Schäff Eur. Schmett. ii., p. 299 (1845) ..	*meticulosa.*
Brotolomia, Led. Noct. Eur., pp. 35 and 115 (1857) ..	*meticulosa.*
Mesolomia, Smith, Cat. Noct. N. Am., p 171 (1897) non descr.	*iris.*

Proboscis fully developed; palpi obliquely upturned, the 2nd joint reaching to about middle of frons and broadly fringed with hair in front, the 3rd short; frons smooth, with large tuft of hair; eyes large, round; antennæ of male with fasciculate cilia; thorax clothed with hair only, the tegulæ produced to a dorsal ridge, the prothorax with triangular crest, the metathorax with large paired spreading crests; tibiæ moderately fringed with hair; abdomen clothed with rough hair at base, with dorsal crests on basal segments and lateral fringes of hair. Forewing with the apex obliquely truncate, the termen and cilia slightly crenulate, the termen slightly excised below vein 4; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from below middle of discocellulars; 6·7 shortly stalked; 8 anastomosing with the cell near base only.

1758*b*. TRIGONOPHORA FUSCOMARGINATA.

Genus CHUTAPHA.	*Type.*
Chutapha, Moore, Lep. Atk, p. 131 (1882)	*costalis.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately scaled, the 3rd short; frons smooth; eyes large, round; antennæ of male typically serrate and fasciculated; head and thorax clothed with hair only, the prothorax with triangular ridgelike crest, the meta thorax with paired crests; tibiæ moderately fringed with hair; abdomen with dorsal series of crests and lateral tufts of hair on terminal segments, the male with extensible basal tufts of long hair from lateral stigmata. Forewing with the apex obliquely truncate, the termen and cilia dentate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male bipectinate with short branches, the apical third ciliated.

1758*a*. CHUTAPHA CONSERVULOIDES.

Sect. II.—Antennæ of male serrate and fasciculate.

1756. CHUTAPHA COSTALIS.

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Genus CONSERVULA.

	Type.
Conservula, Grote, Bull. Buff. Soc. Nat. Sci., ii, p. 17 (1874).	*anodonta.*
Appana, Moore, P. Z. S., 1881, p. 355	*indica.*
A. Forewing with the antemedial line not bent outwards to inner margin	*indica.*
B. Forewing with the antemedial line bent outwards to inner margin	*v-brunnea.*

1827. CONSERVULA INDICA.

1828. CONSERVULA V-BRUNNEA.

Genus OROPLEXIA. *Type.*

Oroplexia, Hmpsn., Cat. Lep. Phal. B. M., vii, p. 510 (1908). *decorata.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to vertex of head and fringed with long hair in front, the 3rd moderate; frons smooth; eyes large, round; antennæ of male ciliated; thorax clothed with long hair mixed with a few hair-like scales and without distinct crests; pectus clothed with long hair; tibiæ moderately fringed with hair; abdomen with some rough hair at base and lateral fringes of hair, but without crests. Forewing with the apex rectangular, the termen evenly curved and slightly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with the reniform angled inwards on median nervure to or to below the orbicular, the postmedial line not filled in with whitish .. *decorata.*

B. Forewing with the reniform not angled inwards on median nervure to or to below the orbicular, the postmedial line filled in with whitish.

a. Forewing with the postmedial line bent inwards along inner margin to the antemedial line .. *retraheus.*

b. Forewing with the postmedial line not bent inwards along inner margin to the antemedial line.

a[1]. Forewing with the antemedial line bent inwards to inner margin .. .. *luteifrons.*

b[1]. Forewing with the antemedial line not bent inwards to inner margin.

a[2]. Forewing with the postmedial line oblique below vein 4.

a[3]. Forewing with the orbicular V-shaped .. *separata.*

b[3]. Forewing with the orbicular oblique quadrate .. .. *simulata.*

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*b*². Forewing with the postmedial line incurved below vein 4 .. .. *albiflexura*.

1774. OROPLEXIA DECORATA.

1772. OROPLEXIA RETRAHENS.

1773. OROPLEXIA LUTEIFRONS.

1775. OROPLEXIA SEPARATA.

1776. OROPLEXIA SIMULATA.

1719. OROPLEXIA ALBIFLEXURA.

Genus DATA.

Type.

Data, Wlk., Journ. Linn. Soc. Zool., vi, p. 191 (1862) .. *thalpophiloides*.

Lasiosceles, Beth. Baker, Nov. Zool., xiii, p. 204 (1906) .. *pratti*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to vertex of head and moderately scaled, the 3rd long; frons rounded; eyes large, round; antennæ of male ciliated; thorax clothed chiefly with scales, the pro- and metathorax with spreading crests; pectus clothed with long hair; mid and hind femora and tibiæ with large tufts of hair, the hind tibiæ with the 1st joint fringed with hair; abdomen with dorsal series of crests. Forewing with the apex produced and acute, the termen crenulate, a slight scale-tooth at tornus; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 absolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with the veins streaked with whitish, the subterminal line white .. .. .. *callopistroides*.

B. Forewing with the veins not streaked with whitish, the subterminal line bluish white towards costa .. *thalpophiloides*.

1769. DATA CALLOPISTROIDES.

1768. DATA THALPOPHILOIDES.

Genus NEOPISTRIA.

Type.

Neopistria, Hmpsn., Cat. Lep. Phal. B. M., vii, p. 530 (1908). *viridinotata*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to vertex of head and moderately fringed with hair in front, the 3rd moderate; frons rounded; eyes large, round; antennæ of male ciliated; thorax clothed chiefly with scales, the pro- and metathorax with spreading crests; tibiæ moderately fringed with hair; abdomen with dorsal crests on basal segments. Forewing with the apex rounded, the termen excurved at middle and excised below apex and towards tornus, where there is a slight scale-tooth; veins 3 and 5 from near angle of cell; 6 from upper angle; 7, 8, 9, 10 stalked; 11 from cell. Hindwing with veins 3·4 from

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angle of cell; 5 obsolescent from just below middle of discocellulars; 6-7 shortly stalked; 8 anastomosing with the cell near base only.

1971. NEOPISTRIA VIRIDINOTATA.

Genus, ERIOPUS.

	Type.
Eriopus, Treit. Schmett. Eur., v. (1), p. 365 (1825) ..	*juventina.*
Callopistria, Hübn. Verz., p. 216 (1827)	*juventina.*
Agabra, Wlk., Journ. Linn. Soc. Zool., vi., p. 136 (1862) ..	*trilineata.*
Obana, Wlk., Journ. Linn. Soc. Zool., vi., p. 190 (1862) nec. Wlk., xxiv., 1103 (1862)	*pulchrilinea.*
Eulepa, Wlk., Journ. Linn. Soc. Zool., vii., p. 54 (1869) ..	*niveigutta.*
Cotanda, Moore, P. Z. S., 1881, p. 374	*placodoides.*
Methorasa, Moore, P. Z. S., 1881, p. 374	*latreillei.*
Herrichia, Grote, New Check List, p. 38 (1882) non. descr., nec. Staud. Lep. 1870	*mollissima.*
Euherrichia, Grote, Papilio ii., p. 122 (1882) non. descr.; id. Ent. Am. vi., p. 163 (1890)	*mollissima.*
Gnamptocera, Butl. A. M. N. H. (6) viii., p. 71 (1891) ..	*minuta.*
Haploolophus, Butl. A. M. N. H. (6) viii., p. 71 (1891) ..	*mollissima.*
Dissolophus, Butl. A. M. N. H. (6) viii., p. 71 (1891) ..	*chloriza.*
Hyperdasys, Butl. A. M. N. H. (6) viii., p. 71 (1891) ..	*exotica.*
Hemipachycera, Butl. A. M. N. H. (6) viii., p. 71 (1891) ..	*rivularis.*
Rhoptrotrichia, Butl. A. M. N. H. (6) viii., p. 71 (1891) ..	*maillardi.*
Platydasys, Butl. P. Z. S. 1892, p. 126	*pryeri.*

Sect: I.—Antennæ of male with the basal part of shaft thickened, then with angular projection from upperside the tibiæ and 1st joint of midtarsi fringed with long hair.

A. Antennæ of male with scale teeth on shaft beyond the angular projection.

a. Antennæ of male with the angular projection tufted with hair and with long curved bristles beyond it from shaft on upper- and under-sides.

1848. ERIOPUS INDICA.

b. Antennæ of male with the angular projection not tufted with hair and without long bristles beyond it.

a[1]. Forewing with the ground-colour dark red-brown. .. .. *æthiops.*

b[1]. Forewing with the ground-colour bright rufous *albistriga.*

1847. ERIOPUS ÆTHIOPS.

1847*a*. ERIOPUS ALBISTRIGA.

Callopistria trilineata, Hmpsn., J. Bomb. Soc. xvii., p. 471 (nec. Wlk).

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Eriopus albistriga, Hmpsn. Cat. Lep. Phal. B. M. vii., p. 538, pl. 120, f. 29 (1908).

B. Antennæ of male without scale-teeth on shaft beyond the angular projection.

a. Antennæ of male with the angular projection strong; the tibiæ and 1st joint of tarsi tufted with hair, the mid tibiæ with the spurs tufted with long hair.

1846. ERIOPUS PLACODOIDES.

Eriopus placodoides, Guen. Noct. ii., p. 296 (1852).

„ *doleschalli*, Feld. Reis. Nov., pl. 110, f. 14 (1874).

b. Antennæ of male with the angular projection slight.

a[1] (*Eriopus*) Antennæ of male with long bristles beyond the angular projection fore and hind tibiæ of male and 1st joint of tarsi fringed with long hair, the mid tibiæ, inner spur and tarsus to near extremity with very large tufts of hair.

1846*a*. ERIOPUS JUVENTINA.

Noctua juventina, Cram. Pap. Exot. iv., pl. 400, f. N. (1782).

„ *purpureo fasciata*, Piller, Prov. Posega, p. 70, pl. vi., f. 2 (1783); Staud. Cat. Lep. pal., p. 183.

„ *lagopus*, Esp. Schmett. iv., pl. 125, f. 7 (1788).

„ *pteridis*, Fabr. Ent. Syst., p. 90 (1794); Hübn. Eur. Schmett. Noct., f. 65; Dup. Lép. Fr. vi., p. 324, pl. 93, ff. 1-2; Frr. Neue. Beitr., pls. 76 and 305.

Pyralis formosissimalis, Hübn. Eur. Schmett. Pyr., f. iii. (1798).

Callopistria obscura, Butl. A. M. N. H. (5) i., p. 200 (1878); id. Ill. Het. B. M. iii., p. 21, pl. 46, f. 3.

Head and thorax bright rufous mixed with yellowish white and some black scales; palpi blackish below; frons with paired black points above; antennæ of male with the basal part of shaft black at sides; tegulæ yellowish at base, with black lines at and near base and yellowish tips; pectus and legs yellowish white mixed with some rufous, the legs irrorated with brown; abdomen yellowish white suffused with fuscous leaving pale segmental lines, the crests rufous tipped with black, the anal tuft tinged with rufous, the ventral surface yellowish white irrorated with black. Forewing bright rufuous irrorated with black, the veins streaked with yellowish white; subbasal line represented by a white striga from costa and oblique yellowish white line from subcostal nervure to vein 1; antemedial line indistinct double, blackish filled in with pink, defined

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on outer side by white at costa, then by pink, angled outwards below costa, then excurved, an oblique pinkish striga before it from submedian fold to vein 1; claviform represented by an oblique pinkish streak, acute and defined by black at extremity; orbicular with rufous centre and yellowish annulus defined by black, very narrow and oblique; reniform white slightly defined by black, its centre ochreous defined by red-brown, produced at upper extremity, and at lower extremity to a hook; a faint oblique black shade from lower angle of cell to inner margin; postmedial line double, black, the inner line strong, the outer slight, filled in with pink, angled inwards below costa, then bent outwards slightly incurved at discal fold, incurved below vein 3, some white points beyond it on costa; subterminal line yellowish white, oblique to vein 7, where it is met by an oblique yellowish white shade from apex, with oblique bar above vein 6, angled inwards to postmedial line above vein 5, then outwards to termen at vein 4, then slight, oblique to submedian fold and bent outwards to tornus; a yellowish white line before termen angled outwards at vein 4, then waved; cilia chequered white and black with a slight blackish line at base. Hindwing yellowish white, suffused with fuscous brown except on costal area; a slight dark discoidal bar, pale postmedial line, and terminal series of dark lunules defined by whitish on inner side; cilia chequered brown and white; the underside white, the costal area tinged with ochreous and slightly irrorated with brown, the apical area tinged with pink, a black striga on upper discocellular, brown postmedial line bent outwards below costa, then slightly waved, incurved below vein 3, subterminal shade from costa to vein 5, and terminal series of small brown lunules.

ab. 1. *obscura.*—Head, thorax and forewing browner and less rufous, with hardly any pink tinge.

Habitat.—Europe; Armenia; Asia Minor; Persia; E. Siberia; Japan; Corea; Central China; W. China; Assam, Khásis. *Exp.* 34-40 mill.

Larva. Kirby, Butt. and Moths Eur., p. 248. Hffmn. Raup., p. 100, pl. 28, f. 5.

Green with oblique yellow subdorsal stripes often defined by pink; lateral line yellow often defined by pink below; warts slight, yellow; head reddish. Food plant: *Pteris aquilina.* 8-6.

b^1. Antennæ of male ciliated beyond the angular projection; tibiæ, 1st joint of tarsi, and inner spur of mid tibiæ fringed with long hair.

a^2. Forewing with orange apical patch .. .. *xanthopera.*

b^2. Forewing without orange apical patch .. *rivularis*

1843*a*. Eriopus xanthopera.

Eriopus xanthopera, Hmpsn., Cat. Lep. Phal. B. M. vii., p. 545, pl. 121, f. 1 (1908).

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Head black mixed with some rufous and white scales; palpi rufous; tibiæ rufous in front; abdomen grey-brown with slight whitish segmental lines, the crests blackish, the anal tuft ochreous. Forewing black slightly mixed with grey, the veins with fine ochreous streaks, some long rufous hair from base of inner margin; subbasal line white, slightly angled outwards below costa and ending at vein 1; antemedial line double, black filled in with ochreous, defined on outer side by a white striga from costa and slightly by grey below the cell, angled outwards below costa, then excurved, an oblique yellow striga before it from submedian fold to vein 1; obicular with yellow annulus defined by black, oblique V-shaped; reniform with oblique white line on inner edge followed by a black line, then yellowish defined on outer side by an oblique white line and triangular spot at lower extremity; postmedial line double, black filled in with white, defined on outer side by a yellowish band with slight dark line on it from vein 6 to inner margin, slightly angled inwards below costa, then bent outwards, very slightly angled outwards at vein 6, incurved below vein 4, and slightly excurved at vein 1, some white points beyond it on costa; subterminal line white with an orange patch beyond it at apex and orange mark at vein 4, angled outwards at vein 7, very slight and angled inward to postmedial line at vein 5, then forming a strong oblique striga to vein 4 near termen, then incurved and almost obsolete, with white striga between veins 3 and 2 and slightly excurved at vein 1; a series of white striæ before termen; cilia blackish with a fine yellow line at base, wholly yellow at tornus, the scale-tooth whitish. Hindwing dark reddish brown; a slight discoidal lunule; cilia whitish with a brown line through them; the underside whitish thickly irrorated with brown, the terminal area suffused with brown, a brown discoidal lunule, postmedial line bent outwards below costa, then waved, incurved below vein 4, a terminal series of small lunules defined by whitish on inner side from apex to vein 2.

Habitat.—MADRAS, Belgaum, Shevaroys; TRAVANCORE, Pirmád, CEYLON, Maskeliya. *Exp.* 30-32 mill.

1843. ERIOPUS RIVULARIS.

Sect. II.—Antennæ of male with the basal part of shaft slightly thickened and without angular projection, down-curved at middle.

A (Rhoptrotrichia).—Antennæ of male with scale-teeth in curve at middle with long cilia from them and a tuft of four long curved hairs from upper side; the tibiæ, spurs, and 1st joint of tarsi fringed with long hairs.

1849. ERIOPUS MAILLARDI.

Eriopus maillardi, Guen Maillard's Reunion, Lep. p. 39, pl. 22, f. 8 (1862).

Callopistria recurvata, Moore, Lép. Atk., p. 144 (1882); id. Lep. Ceyl. iii., p. 60., pl. 151., f. 1; Hmpsn.; Nat. His. Socotra, p. 324, pl. 20, f. 8.

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B. Antennæ of male without scale-teeth, serrations, or long cilia at middle.

a. (*Hyperdasys*) Mid and hind tibiæ and 1st joint of tarsi of male with tufts of very long hair.

a[1]. Forewing with the postmedial line distinct, double filled in with whitish .. .. .. *duplicans.*

b[1]. Forewing with the postmedial line dark and obsolescent .. .. *cœlisigna.*

1845. ERIOPUS DUPLICANS.

1849 *a.* ERIOPUS CŒLISIGNA.

b. (*Dissolophus*). Mid tibiæ of male and tarsus to near extremity fringed with very long hair, the hind femora with fringe of long blackish hair, the tibiæ fringed with long hair.

1839 *d.* ERIOPUS RETICULATA.

Eriopus reticulata, Pag. J. B. Nass. Ver. xxxvii. p. 226., pl. vi., f. 7 (1884).

Callopistria rivularis, Hmpsn. Ill. Het. B. M. ix. p. 103. pl. 163, f. 2 (nec Wlk.).

♂. Head and thorax reddish brown mixed with whitish; frons with lateral white points with black points above and below them; tarsi ringed with white, the fringe of hair from mid femora of male black; abdomen grey suffused with brown and with whitish segmental lines, the crest on 3rd segment tipped with black. Forewing yellowish white suffused with red-brown and irrorated with black, the veins with whitish streaks; subbasal line whitish, curved, from costa to submedian fold; antemedial line double, black filled in with white, slightly angled outwards below costa, then strongly excurved, an oblique whitish striga before it from submedian fold to vein 1; orbicular with black centre and whitish annulus slightly dfiened by black, oblique V-shaped; reniform white, slightly defined by black, more strongly on inner side, oblique, its upper extremity produced, narrowing below, a white striga beyond lower angle of cell, a black patch before it extending to costa; an oblique fuscous shade from lower angle of cell to inner margin; postmedial line double, black filled in with whitish and defined by grey on outer side, angled inwards below costa, then bent outwards, strongly incurved below vein 4, some white points beyond it on costa; subterminal line white, angled inwards to postmedial line above vein 5, then outwards to termen at vein 4, then almost obsolete, incurved and with oblique white striga between veins 3 and 2; the termen black-brown defined on inner side by a fine white line angled outwards to termen at vein 4, then reduced to striæ; cilia black-brown with a yellowish line at base. Hindwing whitish suffused with brown; cilia white tinged with rufous; the underside white irrorated with brown, a slight discoidal bar and indistinct waved postmedial line.

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a b. 1. Forewing with the ante- and postmedial lines defined by points on outerside—New Hebrides.

♀ Much darker.

Habitat.—SIKHIM; TRAVANCORE, Pirmád; CEYLON, Maskeliya, Uva BURMA, Hsipaw, Myingian; SINGAPORE; BORNEO; PULO LAUT; NIAS I.; JAVA; AMBOINA; NEW HEBRIDES; SOLOMONS; FIJI. *Exp.* 26-28 mill.

c. Fore femora of male with tuft of hair at extremity, the mid tibiæ above and frons fringed with long hair, the hind femora with fringe of long blackish hair, the tibiæ with the inner spurs and the tibiæ between them fringed with long hair.

1844. ERIOPUS YERBURI.

Sect. III. Antennæ of male sinuous at middle but not thickened and without ridge of scales.

A. Fore tibiæ of male and 1st joint of tarsi with large tufts of hair, mid tibiæ with very large tufts of hair, the inner spurs fringed with long hair, the first joint of tarsi with very large tufts of hair above and below, the terminal joints with tufts above; hind femora with fringe of long blackish hair, the tibiæ and first joint of tarsi fringed with long hair.

1842. ERIOPUS REPLETA.

B. *(Gnamptocera)* Tibiæ of male normally fringed with hair; forewing with the termen slightly angled at vein 4.

a. Forewing with the medial area yellow, the veins streaked with yellow .. .. *minuta.*

b. Forewing with the medial area rufous, the veins streaked with rufous .. .. *minor.*

1840. ERIOPUS MINUTA.

1841. ERIOPUS MINOR.

Sect. IV. Antennæ of male simple and ciliated.

A. Forewing with the termen distinctly angled at vein 4, the mid and hind tibiæ and first joint of tarsi moderately fringed with hair above.

a. Forewing without oblique white subapical streaks .. .. *guttulalis.*

b. Forewing with oblique white subapical streaks.

a[1]. Forewing with the white bar on inner edge of reniform erect, the veins of medial area not streaked with pink .. .. .. *strigilineata.*

b[1]. Forewing with the white bar on inner edge of reniform oblique, the veins of medial area streaked with pink .. .. .. *renata.*

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1839 *b*. ERIOPUS GUTTULALIS.

1839. ERIOPUS STRIGILINEATA.

1839 *c*. ERIOPUS VENATA.

Callopistria venata, Leech, Trans. Ent. Soc., 1900, p. 111; Hmpsn., Cat. Lep. Phal. B. M., vii, p. 573, pl. 121, f. 11.

Head and thorax black-brown mixed with white and some rufous, a white bar between antennæ, tegulæ with white medial line and whitish tips; tibiæ and tarsi mixed with white: abdomen grey-brown with whitish segmental lines, the crests ochreous and black. Forewing greyish tinged with purplish-pink and thickly irrorated and suffused with black, the veins of medial area with pinkish streaks; subbasal line represented by white striæ from costa and cell with an oblique white striga beyond it across the cell; antemedial line double, black filled in with white and defined by pinkish on outer side, oblique from costa to vein 1, bent inwards to inner margin, an oblique whitish striga before it from submedian fold to vein 1; claviform defined by an oblique pinkish streak above; orbicular with black centre and whitish annulus, oblique elliptical; reniform with oblique white bar on inner side, curved pink lunule in centre defined by black on inner side, its outer edge defined by an oblique white striga and bar beyond lower angle of cell; an oblique series of blackish marks in the interspaces from lower angle of cell to inner margin; postmedial line double, black filled in with white, the inner line lunulate, bent outwards below costa, excurved to vein 4, then incurved, some white points beyond it on costa; subterminal line formed by oblique white streaks above veins 7 and 6, then slight and angled inwards at discal fold, with oblique white streak to termen at vein 4, then obsolescent and defined by blackish on inner side, incurved and with white striga between veins 3 and 2; a terminal series of white lunules; cilia black at tips. Hindwing reddish brown with terminal series of slight brown lunules; cilia with slight white line at base, wholly white at submedian interspace; the underside white irrorated with brown especially on costal area, a slight discoidal spot, waved postmedial line, indistinct diffused subterminal shade, and terminal series of small lunules defined by white on inner side.

Habitat.—CENTRAL CHINA; W. CHINA; ASSAM, Khâsis. *Exp.* 30-36 mill.

B. Forewing with the termen very slightly angled at vein 4.

a. (*Methorasa*) Mid tibiæ of male fringed on both sides with very long hair, the first three joints of tarsi fringed with long hair above, in female the first joint only fringed with hair above; hind tibiæ moderately fringed with hair above.

1838. ERIOPUS LATREILLEI.

b. Mid and hind tibiæ and 1st joint of tarsi and the inner spurs of mid tibiæ with very large tufts of hair and scales.

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1839*a*. ERIOPUS VARIEGATA.

c. Fore, mid, and hind tibiæ of male with large tufts of hair and scales above.

1839*f*. ERIOPUS LEUCOBASIS.

Eriopus leucobasis, Hmpsn. Cat. Lep. Phal. B. M. vii, p. 581, (1900).

Head and thorax purplish brown mixed with some white and black scales; palpi blackish, the extremities of 2nd and 3rd joint white; frons white with lateral black bars; tegulæ with blackish lines at base, middle, and tips; spurs tipped with white, the tarsi ringed with white; abdomen whitish suffused with red-brown leaving whitish segmental bands, the crest on 3rd segment black. Forewing ochreous whitish almost entirely suffused and irrorated with dark purplish-brown; subbasal line represented by double blackish striæ from costa and cell; antemedial line very indistinct, blackish, interrupted, with black line before it from submedian fold to inner margin; orbicular a small indistinct whitish spot; reniform indistinctly defined by whitish, narrow and with white points beyond its lower extremity; a diffused oblique waved blackish line from beyond lower angle of cell to inner margin; postmedial line blackish with white striga at costa, bent outwards below costa, then dentate, oblique, to vein 4, then inwardly oblique, some white spots beyond it on costa; subterminal line strong, white and dentate from costa to vein 6, oblique and yellowish to vein 4, then blackish, waved, with small whitish spot beyond it below vein 3; a terminal series of small black lunules defined on inner side by some white scales; a fine yellowish line at base of cilia. Hindwing with the basal half yellowish white, the terminal half purple-brown; cilia chequered yellowish white and brown; the underside white irrorated with purplish brown except on basal half of inner area, a black discoidal spot, diffused purple-brown medial band, black postmedial line bent outwards below costa, then crenulate, incurved and obsolescent below vein 3, a terminal series of black spots from apex to vein 5.

Habitat.—ASSAM, Khásis; CEYLON, Kandy; PERAK; JAVA. *Exp.* 28-30 mill.

Genus PACHYLEPIS.

Type.

Pachylepis, Feld. Reis. Nov. p. 7 (1874) non. descr.; Hmpsn. Moths. Ind. ii., p. 337 .. .. *dilectissima.*

2109. PACHYLEPIS DILECTISSIMA.

Genus XANTHOLEPIS.

Type.

Xantholepis, Hmpsn. Cat. Lep. Phal. B. M. ix, p. 513 (1910) .. *dicycla.*

Proboscis fully developed; palpi upturned, the 2nd joint broadly scaled, hollowed out on inner side and reaching to middle of frons, the 3rd moderate

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and thickly scaled; frons oblique below and produced to a transverse corneous ridge at middle; eyes large, round; antennæ of female almost simple; thorax clothed almost entirely with scales, the prothorax without crest, the metathorax with depressed crest; tibiæ moderately fringed with hair; abdomen with dorsal crests on basal segments. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from below upper angle; 7 from angle; 8·9·10 stalked; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 shortly stalked; 8 anastomosing with the cell near base only.

2110. XANTHOLEPIS DICYCLA.

Genus BORBOTANA.

Type.

Borbotana, Wlk., xv. 1651 (1858) .. .. .. *nivifascia.*

Choluata, Wlk., Journ. Linn. Soc. Zool., vii., p. 57 (1864).. *nivifascia.*

Proboscis fully developed; palpi upturned, the 2nd joint moderately scaled and reaching about to vertex of head, the 3rd moderate; frons smooth; eyes large, round; antennæ with large tuft of scales from basal joint, in male typically serrate and with long fasciculate cilia; thorax clothed chiefly with scales, the pro- and metathorax with spreading crests; tibiæ thickly scaled; abdomen with dorsal crests on basal segments. Forewing with the apex rectangular, the termen evenly curved; veins 3 and 5 from near angle of cell; 6 from below upper angle; 7 from angle; 8·9·10 stalked, or 10 from cell in male; 11 from cell; forewing of male typically with vein 7 down-curved at base and with groove of ribbed membrane above it. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1756 *b*. BORBOTANA NIVIFASCIA.

Genus PŒCILOGRAMMA.

Type.

Pœcilogramma, Butl., P. Z. S. 1892, p. 126 .. .. *picata.*

Proboscis fully developed; palpi upturned, the 2nd joint reaching to vertex of head and rather broadly fringed with scales, the 3rd moderate frons smooth; eyes large, round; antennæ of male with long cilia; thorax clothed chiefly with scales, the pro- and metathorax with spreading crests formed of long spatulate scales; mid tibiæ fringed with very long hair on outerside, the hind tibiæ moderately fringed with hair; abdomen with dorsal crest at base only. Forewing rather narrow and elongate, the apex rather produced and acute, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from below middle

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of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only. Underside of forewing with rough yellowish scales at base on costa and below the cell; hindwing with rough yellowish scales on base of costa and on inner area.

The typical section has the antennæ and forelegs of male normal.

Sect. I.—Antennæ of male with the shaft excised just before middle, with tuft of hair from upperside just before the excision and slight thickening beyond it; fore coxæ with tufts of long hair, the femora with thick tufts of hair above, the tibiæ with the tuft of long hair on outer side at extremity.

2139*b*. PŒCILOGRAMMA ALBISCRIPTA.

Genus CHYTONIX.

Type.

Chytonix, Grote, Bull. Buff. Soc. Nat. Sci., ii, p. 66 (1874). . . . *palliatricula*

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to vertex of head and moderately fringed with hair in front, the 3rd short frons smooth; eyes large, round; antennæ of male typically ciliated; thorax clothed chiefly with rough scales, the prothorax with spreading crest, the metathorax with very large crest; build slender; tibiæ fringed with long hair; abdomen with dorsal series of crests, the crests on 3rd and 4th segments very large. Forewing with the apex rounded, the termen slightly excised towards tornus and hardly crenulate; veins 3 and 5 from near angle of cell; 6 from or from just below upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with the medial area dark brown below the submedian fold . . . . . *albipuncta*.

B. Forewing with dark fascia on inner margin on medial area . . . . . *excurvata*.

1982. CHYTONIX ALBIPUNCTA.

1979*a*. CHYTONIX EXCURVATA.

Genus PSEUDERASTRIA.

Type.

Pseuderastria, Hmpsn., Cat. Lep. Phal. B. M., vii, p. 614 (1908). *larentica*.

Proboscis fully developed; palpi obliquely upturned, the 2nd joint reaching to vertex of head and moderately scaled, the 3rd rather long, porrect; frons smooth; eyes large, round; antennæ of male ciliated; thorax clothed chiefly with scales, the prothorax without crests, the metathorax with spreading crest; build slender; tibiæ slightly fringed with hair; abdomen with dorsal crests on basal segments. Forewing with the apex rectangular, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form

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the areole; 11 from cell; male with a fovea in cell before middle covered by a valve of scales from median nervure on upperside. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1836. PSEUDERASTRIA LARENTICA.

Genus ŒDEREMIA.

Type.

Œderemia, Hmpsn., Cat. Lep. Phal. B. M., vii, p. 405 (1908).. *lithoplasta.*

Proboscis fully developed; palpi obliquely upturned and slightly fringed with hair in front, the 2nd joint hardly reaching middle of frons, the 3rd short; frons with rounded prominence with curved corneous plate below it; eyes large, round; antennæ of male ciliated; thorax clothed with scales and hair mixed, the pro and metathorax with spreading crests; tibiæ moderately fringed with hair; abdomen with dorsal crests on basal segments, the crest on 3rd segment large. Forewing with the tips rounded, the termen slightly crenulate and somewhat excised towards tornus; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1971c. ŒDEREMIA MEDIALIS.

Œderemia medialis, Hmpsn., Cat. Lep. Phal. B. M., vii, p. 407., pl. 124, f. 8 (1908).

♂. Head and thorax white; palpi brown; tegulæ, patagia at extremities and metathorax suffused with red-brown; fore and mid tibiæ at extremities and the tarsi black ringed with white; abdomen white tinged with rufous except at base. Forewing white; subbasal and antemedial brown patches on costa; a few antemedial black scales below cell and on inner margin; a broad medial brown band with patches of leaden grey scales on it, defined by waved interrupted black lines and with traces of a minute white orbicular with brown centre and black points on its inner and outer edges and a minute black discoidal lunule; the postmedial area with some brown spots on costa and traces of a dentate white postmedial line from costa to vein 3 with some brown suffusion on its inner side and the area beyond it dark defining the subterminal line which is excurved below costa and at middle; terminal area irrorated with brown. Hindwing white with a large fuscous apical patch extending to vein 2; some brown suffusion on inner margin and on termen towards tornus.

Habitat.—BELOOCHISTAN, Quetta. *Exp.* 26 mill.

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PLANTS OF THE PUNJAB.

A BRIEF DESCRIPTIVE KEY TO THE FLORA OF THE PUNJAB, NORTH-WEST FRONTIER PROVINCE AND KASHMIR.

By

Lieut-Colonel C. J. Bamber, F.L.S.,

Indian Medical Service.

Part VI.

(*Continued from page 836 of Volume XX.*)

Herbs, erect, with Opposite Exstipulate Simple Leaves.

Leaf Margins Toothed.

Petals United.

Corolla Two-lipped.

Stamens Four.

Inner Pair of Stamens Longest.

Nepeta eriostachya, Labiatæ. F. B. I. iv. 657. Himalaya, 11,500 ft. Kashmir (Clarke).

small, sparsely hairy; leaves $\frac{1}{2}$-$\frac{3}{4}$ in., ovate or ovate heart-shaped, blunt, round-toothed, sessile, velvety beneath; flowers $\frac{1}{2}$ in., bright blue, in unbranched terminal cylindric-oblong densely flowered hairy spikes, 1-3 in. long, calyx $\frac{1}{4}$ in., sessile, 5-toothed, teeth slender, feathery, tubular, corolla-tube slender near the base, dilated towards the mouth, twice the length of the calyx, 2-lipped, upper lip erect, straight concave notched, lower spreading 3-lobed, lateral lobes small, tuned back, mid-lobe much larger, narrow at the base, concave, stamens 4 in unequal pairs, ascending under the upper lip, enclosed in the corolla, the upper inner and posterior pair longer than the lower outer and anterior pair, style with two awl-shaped lobes, nutlets smooth.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

INNER PAIR OF STAMENS LONGEST.

Nepeta nervosa, LABIATÆ. F. B. I. iv 658. Kashmir, 6-10,000 ft. (Falconer).

medium-size, smooth, rootstock long woody; leaves 2-4 by $\frac{1}{3}$-$\frac{3}{4}$ in., linear-lanceolate, long-pointed, sharply toothed, bracts ovate with an abrupt point, otherwise like the last species.

Nepeta campestris, LABIATÆ, F. B. I. iv. 658. Himalaya, 7-9,000 ft. Simla (Collett).

very like the last species, but the spikes are much longer and more slender, calyx teeth less hairy and more divergent, corolla more slender.

Nepeta elliptica, LABIATÆ. F. B. I. iv. 658. Himalaya, 5-8,000 ft. Simla, Mashobra (Collett).

very like *Nepeta nervosa*, but the leaves $\frac{1}{2}$-1 in. felted and stem woolly.

Nepeta supina, LABIATÆ. F. B. I. iv. 658. Himalaya, 7-12,000 ft. Murree (Fleming).

small to medium-size, finely velvety; leaves $\frac{1}{2}$-1 in. ovate, blunt, round-toothed, felted beneath, flowers $\frac{1}{2}$-$\frac{3}{4}$ in. long, in dense flowered circular clusters, lower axillary, upper in an avoid spike, bracts lanceolate, calyx $\frac{1}{3}$ in, curved, narrow, softly hairy, mouth very oblique, teeth of bristles, shorter than the tube, nutlets $\frac{1}{12}$ in., 3-angled, linear; corolla, stamens, and style as in other species of *Nepeta*.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

INNER PAIR OF STAMENS LONGEST.

Nepeta spicata, LABIATÆ. F. B. I. iv. 659. Himalaya, 6-10,000 ft. Simla (Collett). Murree, Changlagali (Douie).

medium size, smooth or velvety, much branched; leaves 1½-4 by ½-3 in., ovate or triangular heart-shaped, short-pointed, coarsely round or sharp-toothed, leaf stalk 1-3 in., spikes terminal, oblong or cylindric to 4 in. long, bracts ovate or lanceolate with a bristle-like point, calyx sessile ¼ in., bristly, teeth hairly or bristly slender, flowers are otherwise as in *Nepeta campestris*.

Nepeta raphanorhiza, LABIATÆ. F. B. I. iv. 659. Himalaya, 5-12,000 ft. Kashmir to Chamba (Jacquemont).

small to medium-size, rootstock round, black, 1 in. diam., edible, stems many, branched or not, slender, smooth or softly hairy; leaves ½-1 in., broadly ovate or ovate heart-shaped, blunt, round or sharp-toothed, stalk half the length of the blade; flowers ⅓ in. purplish-blue in ovoid or cylindric spikes, bracts ovate to lanceolate, calyx ⅙ in., sessile, teeth lanceolate, shorter than the tube, corolla-tube slender, twice as long as the calyx; other characters like those of other species of *Nepeta*.

Nepeta discolor, LABIATÆ. F. B. I. iv. 659. Himalaya, 10-15,000 ft.

very like the last species in habit and foliage but has a long, not a tuberous root, the leaves are often white-felted beneath, and the flowers white or pale blue.

Nepeta glutinosa, LABIATÆ. F. B. I. iv. 660. Himalaya, 11-13,000 ft. Kashmir.

medium size, velvety from glands, sticky, strongly scented, stem stout, stiff, leafy; leaves ¾-1 in., ovate heart-shaped, short pointed, sharply toothed like a comb, sometimes partly stem-clasping; flowers ¾ in. long, white or blue, in axillary few-

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HERBS ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

INNER PAIR OF STAMENS LONGEST.

flowered circular clusters, bracts linear oblong bristle pointed, calyx $\frac{1}{3}$ in., stalked, teeth ovate with an abrupt point much shorter than the calyx-tube, corolla-tube curved, slender, lips small, otherwise like the other species of *Nepeta*.

Nepeta mollis,
LABIATÆ.
F. B. I. iv. 660.
Himalaya, 8-9,000 ft.
Murree (Fleming).
Kashmir (Jacquemont).

small to medium size, softly felted, stem slender, slightly branched; leaves 1-2 by $\frac{1}{2}$-1 in., ovate-heart-shaped, blunt, round-toothed, shortly-stalked; flowers $\frac{1}{2}$ in., pink in few-flowered circular white softly hairy clusters at intervals on spikes 3-8 in. long, bracts ovate or lanceolate, bristle-tipped, calyx $\frac{1}{4}$ in., mouth oblique, teeth lanceolate, softly hairy, shorter than the calyx-tube, corolla-tube slightly protruding beyond the calyx, lips small, otherwise like the other species of *Nepeta*.

Nepeta distans,
LABIATÆ.
F. B. I. iv. 660.
Himalaya, 6-9,000 ft.
Simla (Collett).
Dewal (Douie).

very like the last, but the bracts are linear and the calyx longer and more curved.

Nepeta ciliaris,
LABIATÆ.
F. B. I. iv. 661.
Himalaya, 6-8,000 ft.
Simla, Mahasu (Collett).

medium size to large, stiff, softly felted; leaves $\frac{3}{4}$-1$\frac{1}{2}$ in., ovate heart-shaped, blunt round-toothed; flowers $\frac{1}{3}$ in., lilac, stalked, in one-sided dense-flowered circular clusters at intervals along softly hairy spikes, 4-8 in. long, bracts lanceolate, often tinged with purple, calyx $\frac{1}{4}$ in. curved, softly

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

INNER PAIR OF STAMENS LONGEST.

hairy, teeth 5, slender, shorter than the tube, nutlets broadly oval with rounded ends, otherwise like the other species of *Nepeta*.

Nepeta ruderalis,
LABIATÆ.
F. B. I. iv. 661.
The Plains to 4,000 ft.
Valleys below Simla (Collett).
Choa Saidan Shah (Douie).

medium-size, annual, velvety, stout or slender, slightly 4-angled, common on road sides; leaves ½-2½ in., green or grey, broadly ovate or circular heart-shaped, shortly stalked, blunt, round-toothed; flowers ¼ in., blue or purple, minutely dotted, stalked in very densely flowered circular one-sided stalked and branched clusters at intervals along softly hairy spikes, calyx ⅙ in., softly hairy, mouth of calyx-tube nearly equal, 3 upper teeth triangular, bristle-tipped, 2 lower thread-like, corolla very small, tube shortly projecting beyond the calyx, nutlets broad, granulate, other characters like those of other species of *Nepeta*.

Nepeta Cataria,
LABIATÆ.
F. B. I. iv. 662.
Kashmir, 1-5,000 ft. (Falconer).
Baluchistan (Lace).

medium size, perennial, stem acutely 4-angled, branched, grey velvety; leaves 1-3 in., ovate or ovate heart-shaped, short-pointed, coarsely round or sharp-toothed; flowers ½ in., dotted with purple in circular clusters on long narrow terminal shortly-stalked densely-flowered spikes 4-10 in. long, bracts awl-shaped equalling or not the calyx, lower bracts leafy, calyx ¼ in. curved, velvety, mouth oblique, teeth nearly equal, awl-shaped, shorter than the calyx-tube, nutlets broadly oblong, smooth, other characters like those of the other species of *Nepeta*.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

INNER PAIR OF STAMENS LONGEST.

Nepeta leucophylla, LABIATÆ. F. B. I. iv. 662. Himalaya, 4-8,000 ft. Simla (Collett).

medium size, slender, branched, grey-felted, stem slightly angled, leafy; leaves 1-1½ in., ovate heart-shaped, blunt or short-pointed, round-toothed wrinkled above, shortly stalked, otherwise like the last species.

Nepeta graciliflora, LABIATÆ. F. B. I. iv. 663. The Plains to 4,000 ft. Valleys below Simla (Collett).

very like *Nepeta ruderalis*, but more slender with thin coarsely round-toothed leaves, longer leaf stalks, flowers pale-pink and nutlets more granulate.

Nepeta Govaniana, LABIATÆ. F. B. I. iv. 663. Himalaya, 8-10,000 ft. Narkanda (Collett).

large, stem 4-angled, branched, finely velvety; leaves 3-6 by 1½-3 in., very variable, ovate or oblong short-pointed, round-toothed, leaf-stalk ½-2 in., flowers 1 in., yellow, stalked, at intervals in few-flowered long-stalked axillary and terminal racemes, calyx ⅓ in., straight, cylindric, teeth triangular, much shorter than the calyx-tube, corolla-tube long, very small, curved, greatly dilated above the middle, nutlets broadly oblong smooth, otherwise like the other species of *Nepeta*.

Nepeta erecta, LABIATÆ. F. B. I. iv. 663. Himalaya, 6-10,000 ft. Mashobra. Narkanda (Collett). Changlagalli (Douie).

very like the last species, but the flowers are blue, and only the lowest clusters are stalked.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

INNER PAIR OF STAMENS LONGEST.

Nepeta Clarkei,
LABIATÆ,
F. B. I. iv. 663.
Himalaya, 7,500-11,000 ft.
Kashmir.
Tilail.
Kunylwan (Clarke).

finely velvety, branched, stem straight, slightly angled; leaves 1-2 in., ovate oblong or lanceolate, somewhat short-pointed, shortly stalked, sharp or round-toothed, flowers ½ in., blue in dense-flowered clusters at intervals along terminal straight spikes 3-6 in. long and shortly stalked in the lower axils, bracts lanceolate, lower leafy, calyx ⅓ in., velvety, teeth nearly equal, triangular, short-pointed, much shorter than the tube, nearly straight, mouth oblique, corolla tube, 3-times the length of the calyx, mouth dilated, lips small, not ¼ in. across; otherwise like the last species.

Nepeta salviæfolia,
LABIATÆ.
F. B. I. iv. 664.
Himalaya, 6-10,000 ft.
Kashmir
(Jacquemont).

medium-size, slender, branched, covered with densely white felt, stem cylindric; leaves 1-1½ in., oblong or ovate, blunt round-toothed, shortly stalked; flowers ¾ in., pale blue or white, in shortly stalked circular clusters at intervals along a long straight narrow raceme or spike, sometimes 12 in. long, bracts minute, awl-shaped, calyx ¼ in. stalked, roughish, teeth triangular nearly equal, much shorter than the tube, corolla-tube very slender, throat shortly dilated, lobes ¼ in. across, nutlets oblong, otherwise like the last species.

OUTER PAIR OF STAMENS LONGEST.

Origanum vulgare, see Herbs, Erect, Opposite, Exstipulate, Simple, Margins Entire.

Calamintha Clinopodium, see Herbs, Erect, Opposite, Exstipulate, Simple, Margins Entire.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR OF STAMENS LONGEST.

Calamintha umbrosa, LABIATÆ. F. B. I. iv. 650. Himalaya, 4-12,000 ft. Simla, Mahasu (Collett).

small, annual, hairy, stems ascending, rooting at the base; leaves $\frac{3}{4}$-$1\frac{1}{2}$ in., ovate, sharply toothed, shortly stalked; flowers pink-purple, $\frac{1}{4}$ in. long, in small loose whorls, bracts few, short, calyx 2-lipped, tubular, 13-nerved, upper lip 3-toothed, lower 2-toothed, lower longer narrower, mouth open after flowering, corolla 2-lipped, upper lip erect, nearly flat, notched, lower 3-lobed, spreading, stamens 4, in unequal pairs, style-tip divided, nutlets 4, minute, nearly round, smooth.

Dracocephalum speciosum, see Herbs, Unbranched, Simple, Toothed.

Dracocephalum nutans, see Herbs, Unbranched, Simple, Toothed.

Dracocephalum moldavicum, LABIATÆ. F. B. I. iv. 665. Himalaya, 7-8,000 ft. Kashmir (Falconer).

medium-size, annual, quite smooth, branched from the base; leaves 1-2 in., lanceolate, deeply bluntly toothed, sessile or narrowed into a short stalk, flowers $\frac{3}{4}$-1 in., blue, shortly stalked, in circular clusters at short or long intervals along leafy spikes, 4-8 in. long, bracts lanceolate with bristle points, calyx $\frac{1}{3}$ in., 2-lipped, leathery, smooth, upper lip broad, 3-toothed, teeth broadly ovate with abrupt points, corolla 2-lipped, upper lip erect notched, lower spreading, 3-fid, mid-lobe largest, tube greatly dilated to the throat, stamens 4, in unequal pairs, ascending under the upper lip, nearly projecting beyond it, style-lobes awl-shaped; nutlets 4, smooth, narrowly oblong abruptly cut off at both ends.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR OF STAMENS LONGEST.

Dracocephalum stamineum, see Herbs, Prostrate, Opposite, Exstipulate, Simple Toothed.

Lallemantia Royleana, LABIATÆ. F. B. I. iv. 667. The Plains to 3,000 ft. Sargodha (Douie). Baluchistan (Boissier). small, annual, branched or not, stem slightly angled; leaves ½-1 in., ovate or oblong, blunt, coarsely round-toothed; flowers ⅔ in., pale lilac, shortly-stalked, in many circular clusters at intervals along narrow long spikes, bracts small, soon falling off, oblong, or lanceolate, teeth with long bristle points, calyx ⅓ in., erect, stiff, 2-lipped, upper lip with 3 obtuse lobes of which the lateral are under the mid-lobe, corolla-tube hardly projects beyond the calyx, lobes small, stamens 4, in unequal pairs, ascending under the upper lip of the corolla, and enclosed within it, otherwise like *Dracocephalum*.

Scutellaria grossa, LABIATÆ. F. B. I. iv. 669. Himalaya, 4-8,000 ft. Simla, Mashobra (Collett). medium size, perennial, velvety, stem slender growing along the ground, then ascending, branched, nearly round; leaves 1-3 by ¾-2 in., ovate, triangular or lanceolate, short-pointed, coarsely round-toothed, smooth, stalk ¼-1 in., slender; flowers ¾ in., dark-blue, solitary, axillary, forming terminal slender racemes, 3-6 in. long, bracts ¼-⅓ in., longer than the calyx, calyx 2-lipped, lips closed in fruit upper lip soon falling off, tube bearing on it a small shield or cup, (scutellum), corolla-tube much longer than the calyx, sharply upcurved near the base, dilated upwards, 2-lipped, upper lip erect, hood-like, notched, lower spreading, 3-lobed, stamens 4 in unequal pairs, ascending under the upper lip, anthers hairy; nutlets 4, slightly velvety.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR OF STAMENS LONGEST.

Scutellaria angulosa, LABIATÆ. F. B. I. iv. 669. Himalaya, 4-9,000 ft. Simla (Collett). Dharmpur.

medium size, perennial, velvety or thinly hairy, branches long, spreading, sharply 4-angled; leaves 1-3 in., ovate or lanceolate, bluntly or shortly pointed, round or sharp-toothed, shortly stalked lower surface often purple; flowers 1 in., white or yellowish, tip tinged with purple, in leafy racemes, bracts leafy, upper small entire, nutlets granulate; otherwise like the last species.

Scutellaria galericulata, Skull cap, LABIATÆ. F. B. I. iv. 670. Himalaya, 5-8,000 ft. Kashmir, Koti.

medium size to large, perennial, slightly velvety, stem procumbent at first then erect; leaves $1\frac{1}{2}$-$2\frac{1}{2}$ in., ovate-lanceolate blunt, or nearly shortly pointed round-toothed, shortly-stalked, upper leaves are not toothed; flowers $\frac{3}{4}$ in., yellow, shortly stalked in the axils of leaves and bracts, bracts much longer than the calyx; otherwise like the last species.

Brunella vulgaris,

see Herbs, Opposite, Exstipulate, Simple, Entire, Corolla Two-lipped, Stamens Four.

Marrubium vulgare, White horehound, LABIATÆ. F. B. I. iv. 671. Himalaya, 5-8,000 ft. Kashmir (Falconer). Baluchistan (Boissier).

large, leafy, stout, shortly woolly; leaves $\frac{1}{2}$-$1\frac{1}{2}$ in. diam., ovate or circular-toothed, wrinkled, stalk $\frac{1}{4}$-$\frac{1}{2}$ in.; flowers $\frac{1}{2}$ in., white in circular axillary clusters, many and dense-flowered, woolly, calyx $\frac{1}{6}$-$\frac{1}{4}$ in., teeth 10 awl-shaped, spreading and hooked, throat woolly, corolla short 2-lipped, upper lip erect, divided, lower spreading, mid-lobe largest, stamens 4, enclosed in the corolla, style-lobes short, blunt; nutlets 4, blunt, smooth.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR OF STAMENS LONGEST.

Craniotome versicolor, LABIATÆ. F. B. I. iv. 671. Himalaya, 5-7,000 ft. Simla (Collett).

medium-size, perennial, softly hairy all over stem round, slender; leaves 2-4 by 1-3 in., broadly ovate heart-shaped, long-pointed, sharp or round-toothed, stalk 1-2 in., slender; flowers $\frac{1}{3}$ in., white, pink or yellow, numerous, crowded in small, stalked clusters forming narrow terminal branched leafy racemes, bracts awl-shaped, calyx $\frac{1}{10}$ in., ovoid equally 5-toothed, teeth triangular, corolla tube much longer than the calyx, 2-lipped, upper lip very short, erect, hood like, lower longer spreading, 3-lobed, mid-lobe largest, stamens 4, in unequal pairs, ascending under the upper lip, style nearly equally divided; nutlets 4, very minute, nearly round, shining.

Anisomeles ovata, LABIATÆ. F. B. I. iv. 672. The Plains to 5,000 ft. Valleys below Simla, Sipi (Collett).

large, annual, hairy, or felted and densely woolly; leaves 1-3 in., ovate, round toothed, long pointed, stalk $\frac{1}{2}$-$1\frac{1}{2}$ in.; flowers $\frac{1}{2}$ in., white, mid-lobe of lower lip purple, crowded in axillary clusters at intervals along terminal spikes, bracts variable. calyx $\frac{1}{4}$-$\frac{1}{3}$ in., hairy, ovoid, teeth 5, lanceolate, long-pointed, corolla-tube short, 2-lipped, upper lip short, erect, concave, entire, lower 3-lobed, spreading, mid-lobe much longer than the lateral, deeply notched, stamens 4 in unequal pairs, protruding, style nearly equally divided: nutlets 4, broadly, oblong, polished.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR OF STAMENS LONGEST.

Stachys floccosa, Woundwort,
LABIATÆ.
F. B. I. iv. 675.
Himalaya, 5-6,000 ft.
Kashmir (Jacquemont).

large, stout, densely covered with white wool stem 4-angled; leaves 3-4 by 1-2 in., ovate or ovate-lanceolate, heart-shaped, shortly pointed, round-toothed, thick, velvety above, stalk ½-1 in., very thick; flowers ½-¾ in., pink, spotted with purple sessile, crowded in axillary woolly clusters and in terminal spikes with interspaces, bracts as long as the calyx, calyx ¼ in., bell-shaped, 10-nerved, teeth 5, triangular points, spinous, coloured pink, corolla two-lipped, woolly, upper lip erect, lower spreading 3-lobed, mid-lobe largest, tube shortly projecting out of the calyx, stamens 4, ascending, style-lobes nearly equal; nutlets 4, ovoid smooth.

Stachys sericea,
LABIATÆ.
F. B. I. iv. 675.
Himalaya, 6-9,000 ft.
Simla, Mashobra (Collett).
Murree (Douie).

very like the last species only less woolly, and sometimes unbranched.

Stachys melissæfolia,
LABIATÆ.
F. B. I. iv. 675.
Himalaya, 8-10,000 ft.

very like the last species, only more slender, less hairy, silky and leafy, the calyx is shorter, as broad as long, teeth triangular with a thickened tip not ending in a spine.

Stachys palustris, Marsh betony,
LABIATÆ.
F. B. I. iv. 676.
Himalaya, 5-6,000 ft.
Kashmir (Thomson).

medium-size, perennial, stem 4-angled, bristly with reversed hairs; leaves 3-4 by ¾-1 in., narrowly oblong or ovate-lanceolate, long-pointed, toothed, sessile, floral leaves longer than the calyx; flowers small, pink in 6-flowered circular clusters, ½-1 in. diam., at intervals, never spicate, bracts minute,

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR OF STAMENS LONGEST.

calyx ⅓ in., hairy, teeth lanceolate, tips spinescent, corolla-tube not projecting beyond the calyx, nutlets broadly ovoid, broader towards the top, nearly smooth; otherwise like the last species.

Stachys sylvatica, LABIATÆ. F. B. I. iv. 676. Kashmir (Falconer).

medium-size to large, rough with long stiff hairs, rootstock growing along the ground, stem 4-angled; leaves 2-4 in., long-stalked, broadly ovate, heart-shaped, toothed, softly hairy, floral leaves sessile, longer than the calyx; flowers ½ in., pink, in glandular-hairy few-flowered circular clusters, bracts minute, calyx ⅓ in., teeth triangular, tips needle-like, corolla-tube projecting from the calyx, nutlets nearly round; otherwise like the last species.

Stachys parviflora, LABIATÆ. F. B. I. iv. 677. The Plains to 5,000 ft. Salt Range, Sakesar. Rawalpindi (Douie). Baluchistan (Lace).

medium size, perennial, densely covered with flocculent white wool, stem and branches very stout, nearly round, branched from the base; leaves 1-3 in., very variable, smooth and shining or cottony above, oblong or ovate or lanceolate, thick, sessile, upper leaves woolly all over; flowers pink or red-purple, very small in clusters separated, 2-4 flowered, calyx ⅛-⅙ in., immersed in wool, cupular, teeth short, incurved over the nutlets, corolla-lips very small, upper short, rounded, nutlets 2, ⅙ in. long, grey, granulate, flat on one side, convex on the other; otherwise like the last species.

Leonuru Cardiaca, see Herbs, Erect, Opposite, Exstipulate, Lobed.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR OF STAMENS LONGEST.

Lamium rhomboideum, LABIATÆ. F. B. I. iv. 678. Himalaya, 12-15,000 ft. In stony debris.

small, stem very stout, zigzag, densely felted; leaves lower small, upper 2-4 in. diam., crowded, square, wrinkled, toothed, base suddenly contracted into a very thick, short woolly stalk; flowers 1½ in. long, purplish in axillary, many-flowered, clusters or in leafy heads, bracts awl-shaped, calyx ¾ in., woolly, teeth 5, lanceolate, 5-nerved, corolla 2-lipped, upper lip arched, lower spreading, 3-lobed. mid-lobe broad contracted at the base, tube straight, naked within, upper lip or hood, broad, woolly, lateral lobes ovate, undivided, stamens 4, ascending under the upper lip, anthers hairy, style lobes awl-shaped; nutlets 4, sharply three-cornered.

Lamium amplexicaule, see Herbs, Prostrate, Opposite, Exstipulate, Simple.

Lamium album, see Herbs, Prostrate, Opposite, Exstipulate, Simple.

Leucas urticæfolia, LABIATÆ. F. B. I. iv. 680. The Plains. Choa Saidan Shah (Douie). Baluchistan (Boissier).

small, annual, stem covered with white hairs; leaves 2-3 in., ovate, stalked, coarsely toothed, smooth or covered with white hairs; flowers ½ in., white in axillary round clusters, 1 in. diam., many flowered, at distant intervals, bracts hairy, bracteoles as long as the calyx, calyx ⅓-½ in., cylindric, netted, velvety or hairy, 2-lipped, lower lip abruptly cut off, teeth minute, corolla-tube within the calyx, not ringed within, 2-lipped, upper lip concave, erect, crown woolly, lower lip spreading, 3-lobed, mid-lobe very large, stamens 4, in unequal pairs, ascending under the upper lip, style one-lobed; nutlets 4, ovoid, sharply 3-angled, blunt.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR OF STAMENS LONGEST.

Leucas lanata, LABIATÆ. F. B. I. iv. 681. Himalaya, 3-8,000 ft. Simla (Collett).

medium-size to large, root-stock stout woody, stem sometimes woody, branches stout, nearly 4-angled, everywhere densely woolly, hairs erect; leaves 1-3 in., thick, ovate or oblong, blunt or short-pointed, round-toothed, bracts bristle-like: otherwise like the last species.

Leucas nutans, LABIATÆ. F. B. I. iv. 688. The Plains.

small, annual, branches spreading; leaves 1-2 in., oblong or linear-oblong, blunt, slightly toothed, sometimes stalked; flowers small in terminal and axillary dense-flowered clusters, calyx $\frac{1}{3}$ in., bent down, hairy, deeply marked with lines, thin, teeth long, much longer than the hairs of the mouth; otherwise like the last species.

Leucas Cephalotes, LABIATÆ. F. B. I. iv. 689. The Plains to 6,000 ft. Valleys below Simla (Collett).

large, annual, stout, hairy, hairs spreading: leaves 2-4 in., ovate or ovate-lanceolate, short-pointed, shortly-stalked, round and sharp-toothed; flowers in very large terminal round clusters, 1-2 in. diam., surrounded by membranous overlapping linear lanceolate bracts, bristle—pointed, unlike those of any other species, calyx $\frac{3}{4}$ in., tubular, slightly curved, velvety, teeth short awl-shaped, not longer than the hairs of the mouth; otherwise like the last species.

Leucas aspera,

see Herbs, Erect, Opposite, Exstipulate, Simple, Entire.

Leonotis nepetæfolia, LABIATÆ. F. B. I. iv. 691. The Plains. Berara, Ambala Dist.

large, annual, stem 1 in. diam., 4-angled, grooved, minutely velvety; leaves 4-8 by 2-5 in., ovate, round-toothed, thin, stalk 1-3 in., winged above, slender, floral leaves lanceolate, sharply bent down: flowers 1 in. long, orange, in densely many flowered

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR OF STAMENS LONGEST.

globular clusters 2-3 in. diam. round the stem, like the head of a drum stick, at some distance apart, prickly from the spinescent bracts, bracteoles many, slender, calyx ¾ in. long, ribbed, netted velvety or woolly, tubular turned in, mouth oblique, teeth 8-10, spines, upper ¼ in. long, lower with 3 recurved spinescent teeth, corolla-tube slender, projecting beyond the calyx, 2-lipped, upper lip long, concave, crown woolly, lower minute, spreading, concave, mid-lobe largest, stamens 4, in unequal pairs, ascending under the upper lip, style awl-shaped, 2-lobed, upper lobe very short; nutlets 4, sharply 3-angled, linear-oblong, widening upwards, cut off short.

Phlomis spectabilis, LABIATÆ.
F. B. I. iv. 692.
Himalaya, 3-8,000 ft.
Kashmir (Jacquemont)
Abbotabad (Barrett).
Baluchistan (Lace).

large, stem 1 in. diam., round, white with hairs, or downy with star-shaped hairs; leaves 6-10 by 4-8 in., ovate heart-shaped, round-toothed or nearly small-lobed, wrinkled, felted with star-shaped hairs beneath, tip rounded, stalk 6-12 in., floral leaves small; flowers rose-purple in axillary many flowered circular clusters, 1½-2 in. diam., with rigid thread-like bristly needle-pointed bracts, calyx ½-¾ in., velvety, mouth equal, 5-toothed, teeth spiny ⅓ shorter than the calyx-tube, corolla tube ringed within, 2-lipped, upper lip concave, crown woolly, fringed with silvery hairs, lower spreading, 3-fid, stamens 4, in unequal pairs, ascending, style 2-fid; nutlets 4, ¼ in., linear.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR OF STAMENS LONGEST.

Phlomis cashmeriana, LABIATÆ. F. B. I. iv. 692. Himalaya, 5-6,500 ft. Kashmir (Royle).

medium-size, root-stock stout, stems several, stout, covered with white loose star-shaped woolly hairs; leaves 5-9 by 2-4 in., linear oblong, blunt-pointed, round-toothed, wrinkled, base heart-shaped, leathery, finely velvety above, stalks 4-6 in., flowers pale purple in many-flowered axillary circular clusters, 1-1½ in. diam., bracts ⅔ in., many, thread-like, felted, tip needle-like, calyx ½-¾ in., folded, felted, teeth spiny, ½ the length of the calyx tube, corolla upper lip very large, felted, not fringed, lower lip very broad, nutlets ⅙ in. long, broadly oblong: otherwise like the last species.

Phlomis setigera, LABIATÆ. F. B. I. iv. 693. Kashmir (Clarke).

large, stem 1 in. diam., nearly smooth, 4-angled like the branches; leaves 4-8 in., ovate, long-pointed, round-toothed, base rounded or heart-shaped, stalks ½-1 in.; flowers in many-flowered axillary circular clusters, bracts short, stiff, bristle-like, tips spiny, calyx ⅓-½ in., hairy, teeth erect, awl-shaped, ⅓ the length of the tube; nutlets ⅙ in., ovoid with broad top as if cut off short: otherwise like the last species.

Phlomis bracteosa, LABIATÆ. F. B. I. iv. 695. Himalaya, 5-11,000 ft. Simla, Mashobra (Collett).

large, stout, velvety with white hairs, stem and branches 4-angled, hairs on the stem, when present, sharply turned down; leaves 2-4 in., (in Kashmir, 6-8 in. long, ovate-lanceolate, long-pointed) ovate, blunt-pointed, round-toothed, base broadly heart-shaped, stalked; flowers 1 in., dull blue-purple, in many dense-flowered axillary

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS UNITED.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR OF STAMENS LONGEST.

circular clusters, $\frac{3}{4}$-1 in. diam., bracts erect equalling the calyx, outer thin lanceolate or linear, tip not spinous, inner narrower, calyx $\frac{1}{8}$-$\frac{1}{2}$ in., tubular, hairy or smooth, 5-toothed, teeth slender with scattered hairs, corolla upper lip fringed with white hairs, nutlets $\frac{1}{8}$-$\frac{1}{6}$ in., ovoid with the tip broad and rounded: otherwise like the last species.

Ajuga bracteosa, LABIATÆ. F. B. I. iv. 702. The Plains to 7,000 ft. Simla (Collett). Abbottabad. Rawalpindi Kahuta (Douie).

small, stems and branches from the root-stock many, velvety or smooth; leaves 1-4 in., lanceolate with a broad tip or spoon shaped, blunt-pointed, toothed more or less, lower stalked, upper sessile; flowers $\frac{1}{3}$ in., pale blue or lilac, crowded in axillary circular clusters at short intervals forming leafy spikes, much shorter than the ovate leafy bracts, calyx $\frac{1}{6}$ in., 5-toothed, softly hairy, teeth $\frac{1}{2}$ the length of the tube, ovate-lanceolate, short-pointed, corolla-tube straight, nearly twice the calyx, 2-lipped, upper lip very short, erect, deeply notched, lower spreading, mid-lobe dilated, side-lobes oblong, stamens 4, in unequal pairs, protruding, style 2-lobed; nutlets $\frac{1}{10}$ in., oblong with rounded ends, deeply wrinkled, pitted.

Ajuga parviflora, LABIATÆ. F. B. I. iv. 703. Himalaya, 2-7,000 ft. Simla (Collett). Murree (Douie).

like the last species, but the corolla is smaller, the base is not inflated, the stamens are included, the flower clusters are on bracteate spikes and not axillary.

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HERBS, ERECT, WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

LEAF MARGINS TOOTHED.

PETALS NONE.

COROLLA TWO-LIPPED.

STAMENS FOUR.

OUTER PAIR OF STAMENS LONGEST.

Euphorbia hypericifolia, see Herbs, Erect, Opposite, Stipulate, Simple, Entire, Petals None.

Bryophyllum calycinum, see Herbs, Erect, Opposite, Exstipulate, Simple Toothed, Petals None.

(To be continued.)

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PROTECTION OF WILD BIRDS IN INDIA AND TRAFFIC IN PLUMAGE

BY

P. T. L. DODSWORTH, F. Z. S.

In the *Selborne Magazines* for 1910, Mr. James Buckland has described the enormous havoc which is being made among the birds of the world to satisfy fashion's demands for millinery. For commercial purposes the feathers must be procured during the breeding season, for the reason that the plumes are at that period in their prime condition. At other times they lack smoothness, lustre, and elasticity, and are, therefore, worthless to the milliner. Many species of birds resort annually to ancestral homes with the object of reproducing their kind, and the feather hunters avail themselves of these opportunities. Thirty years ago the heronries in the United States contained about 3,000,000 White Herons, and now they have been practically exterminated. In the low Coral Islands in the North Pacific the destruction of birds by Japanese "plume hunters" has been appalling. On Marcus Island, one of the largest Albatross colonies in these waters has been wiped out. Midway Island was found, by the United States Special Inspector of Birds and Animals, to be covered with innumerable Albatross carcasses, which a crew of poachers had left to rot on the ground, after the quill feathers had been pulled out of each bird. On Lisiansky Island, the property of the United States and a bird reservation, some poachers from Yokohama were caught, and it was found that they had in their possession the skins and feathers of 300,000 birds. On the Hawaiian Islands Reservations, twenty-three plumage pirates, who were arrested, had in their possession 259,000 pairs of birds' wings. These raids led to an interchange of views between Washington and Tokio, and despite stringent orders issued by the Japanese Government, no check has resulted on the activity of plunder. In 1898, 1,538,738 Egrets were killed in Venezuela for their plumes, and ten years later only 257,916 birds were found by the hunters. Exclusive of the plumes of Egrets, the port of Cuidad Boliwar shipped in a single year (1908), 10,612 pounds, or nearly five tons weight of other plumage. The American Jabiru, the largest but one of all living storks, found in the shallow lagoons on the great Savanna regions of the Middle Orinoco basin, is on the verge of extirpation—in London alone about 30,000 of their quills are sold annually. So relentlessly has the humming bird been pursued for its feathers, that certain species in the West Indies with a restricted habitat are already exterminated, while in the case of other species a similar fate seems imminent. In Trinidad there were, till a few years ago, eighteen species of humming birds, now there are only five. At three plume sales held in London this year, the

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skins of over 25,000 humming birds were catalogued, and sold for a penny or three half pence each. The shore birds of the Atlantic Coast of the United States which formerly were found in incredible numbers have only been saved from complete annihilation by the timely appointment of wardens. The poaching in these regions has assumed so serious an aspect that quite recently three of the wardens have been murdered while discharging their duties. In the lake district of Southern Oregon—the nursery of immense flocks of migrating waterfowl of the Pacific Coast—hundreds of tons of ducks were found, by an Official of the Biological Survey, to have been killed for their green wing feathers, and the bodies thrown away. White Herons, Swans, Pelicans, Ibises, Terns, and other species too numerous to mention, were all butchered in a like way, and for a like paltry purpose.

Realising that wild birds constitute a valuable asset to the countries which possess them, various legislative measures have been taken by our overseas possessions to protect bird life, but all these well meaning efforts have been rendered abortive by illicit export. Feathers are conveyed clandestinely out of the country under fictitious names, or under false declarations. In March 1908, six cases described as containing "cow-hair" were shipped from India, and were found on their arrival in London to consist of the skins of 6,400 green paraquets. A vast number of feathers which are used in the millinery trade in Great Britain are smuggled into her ports under false declarations; and the action of the brokers by suppressing all detailed advertisements of the London plume sales, says Mr. Buckland, "is indicative of a knowledge on their part that there is being carried on in the heart of the City a business of so questionable a nature that it is expedient in their interests to interpose darkened glasses, or the equivalent, between its inner history, and the eyes of the public."

In conclusion, Mr. Buckland adds that the traffic in ornamental feathers is a national disgrace, and must be stamped out.

The great interest and criticism which this article has called forth, has prompted us to examine the various measures which have been taken, from time to time, in India for the protection of bird life, and we publish the results of our enquiries in the hope that, not only will they be of some interest to ornithologists in general, but also that some good may come of them.

The fauna of British India is protected by the following Acts and Rules :—

(1) *Madras Act II of* 1879.—The operation of this Act is confined to the Nilgiris. It provides for close seasons, and prohibits the killing, capturing, and selling of game and fish during such seasons.

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(2) *The Elephant Preservation Acts of* 1873 *and* 1879. (Madras I of 1873, and India VI of 1879).—These Acts prohibit the killing, injuring, or capturing of wild elephants, except in self defence or under a license.

(3) *Forest Laws.* (*a*).—The Indian Forest Act, 1878 (VII of 1878)—Sections 25 (*i*) and 31 (*j*); (*b*) Madras Forest Act, 1882—Sections 21 (1) and 26 (*f*); and (*c*) Burma Forest Act, 1902—Sections 26 (*h*) and 33 (*c*).

The amount of protection afforded by the rules made under these laws differs in various Provinces. They provide (except in the case of Coorg) for a close season, and most of them require permits before any hunting, snaring, or trapping can be indulged in in reserved forests.

(4) *The Wild Birds and Game Protection Act of* 1887. (Act XX of 1887).

(5) *The Act relating to Fisheries in British India.* (Act IV of 1897). This Act prohibits the destruction of fish by dynamite or other explosive substance in any water, or by the poisoning of water; and provides for the protection of fish in selected waters.

As the scope of the present enquiry is restricted to birds alone, it will only be necessary to turn our attention to No. (4)—The Wild Birds and Game Protection Act of 1887. This Act extends to the whole of British India, and empowers Local Governments, Municipalities, and Cantonments to frame rules prohibiting (*a*) the possession or sale during its breeding season within the Municipality or Cantonment of any kind of Wild Bird recently killed or taken; and (*b*) the importation into the Municipality or Cantonment of the plumage of any kind of wild bird during such season.

It would be tedious and wearisome to dilate on the early history of what is known as the "protection" movement, which, beginning in 1869, culminated in the Act of 1887. It will suffice to state for our purpose that in 1886 the question of having a general game law for India engaged the attention of the authorities, but such law was then considered unnecessary. It was, however, decided that Local Governments should be empowered to frame rules prohibiting the sale of game within cantonments or towns during a specified season of the year, and with this object, the Act (XX of 1887) was passed. It is chiefly directed against the destruction of birds, but Local Governments have the power to apply its provisions to any other game.

The limited provisions of this Act, which apply to Municipal and Cantonment areas only, will be readily understood when we bear in mind some of the reasons which actuated Government in objecting to afford wider and more stringent measures of protection. They were:—

(*a*) The predominant claims of agriculture, to which all other considerations must be subservient.

(*b*) The undesirability of interfering with the livelihood of forest and other wild tribes, who depend largely upon the capture of game for their subsistence.

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(c). The general objection to the creation of new penal offences.

(d). The unjustifiability of legislation in the interests of the sportsmen.

(e). The absence of evidence that the destruction of birds for the sake of their plumage was carried out on an extensive scale, and that there was any serious diminution in their numbers.

In 1900 the Honorary Secretary of the Society for the Protection of Birds raised the question of the advisability of stopping the export of the plumage of ornamental birds; and in the following year in the Budget Debate of the 27th March in the Supreme Legislative Council, the Hon'ble Sir Allan Arthur urged upon Government the expediency of protective measures for game in India. During his visit to Burma in 1901 Lord Curzon was approached upon the subject in a public address. His Lordship returned a sympathetic reply, admitting that the enactments in force did not go far enough, and that more stringent measures were called for. In addition to this, numerous other representations to a similar effect were received by Government, or appeared from time to time in the public press.

In view of these representations, and of the fact that a considerable time had elapsed since the passing of the Wild Birds and Game Protection Act of 1887, Lord Curzon's Government decided to enquire into the matter, and to ascertain how far the existing measures had been attended with success. The Local Governments were accordingly asked to report (i) upon the working of the Act in question; (ii) whether it afforded an adequate measure of protection; (iii) the extent to which the skins of birds of handsome or useful plumage were exported, and whether the trade had increased or decreased of late years; and (iv) whether there was any extensive destruction of wild birds, especially of non-migratory insectivorous birds, during what should be close seasons for them; and, if so, whether it was leading to the extermination of any species.

The replies received to this reference showed clearly that the working of the Act had proved a failure. And this was only to be expected, since the prohibitions applied only within a specified cantonment or town during a specified season. Rural areas (except forest areas) were beyond the scope of the Act. There was nothing to prevent birds being killed during the close season, and the detention of their skins or feathers outside Municipal or Cantonment limits as the case might be, until the prescribed period was over; or by the transfer of the bird-killing operations beyond the specified boundaries.

As to the adequacy or otherwise as a measure of protection, the general concensus of opinion was that existing legislation did not sufficiently meet the necessities of the case. After a careful review of the whole subject,

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the authorities have taken up the question of the advisability of a general Game Law for the protection of game in India, and this is at present under consideration. The proposed bill is of a very simple nature, and affords adequate protection to those wild birds and animals which are threatened with extermination. It defines game, and takes power for Local Governments to declare a close time during which it will be unlawful to capture, kill or deal in any specified kind of game or the plumage of any specified bird. The proposed measure, moreover, provides a general exception in favour of the capture or killing of game in self-defence or in protection of crops, and gives power to the Local Governments to apply its provisions to birds other than certain specified ones. Fish have been excluded from the scope of the proposed bill, as their case has been suitably provided for by rules under the Indian Fisheries Act.

The replies to (iii) and (iv), in respect of exportation and destruction, disclosed not only a serious, but a most disastrous, state of affairs. From all parts of the country came the same cries of destruction and diminution, which amounted to virtual extermination. Of Impeyan and Argus pheasants throughout the Himalayas, of Peacocks and Black Partridges from Bombay, of Egrets from Sind and Burma, and of a host of others, including Jungle-cocks, Paddy-birds, Kingfishers, Jays, and Orioles throughout India generally. So lucrative was the trade that single districts, such as Lucknow in the United Provinces, and Amritsar in the Punjab, contributed between them nearly 16,000 lbs. of plumage annually. Taking as an average 30 skins to the pound, the figures indicated the destruction of nearly five hundred thousand birds in a single year from two districts alone! From Bombay it was reported that a single Railway Station to the north of Sind had exported within a few months 30,000 skins of Black Partridges, and that over many square miles in the Rohri Division these birds had, within two seasons, been absolutely exterminated by a single party of professional trappers. Various other reports showed that birds were netted and trapped, not by thousands, but by millions, without any regard to season or sex. The hen on her eggs, or with chicks at her feet, were all fair spoil to these unscrupulous hunters. A Postal Official, who was stationed for many years at Dharmsala, gives an interesting account of these operations. "Monal and Argus pheasants," he remarks, "are snared in large numbers by professional trappers in the Kashmir and Chamba Native States, and also in the hills near Kulu, Dalhousie, Dharmsala, Palampur, etc. Snares are set in localities which are not frequented by sportsmen and others, and female birds and animals are destroyed *wholesale*. I have personally seen scores of young Monals and female pheasants entangled in the snares. The intention of the snares is, of course, to entrap male Monal and Argus Pheasants, but the system is such that every living thing that comes into the traps is destroyed. A

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short description of the system of snaring might prove of some interest. A hedge of branches of trees, brushwood and grass is erected from the bottom of a hill to the top. At every ten or twelve paces, there is a small opening in which a spring snare is fastened. The snare is composed of a bent branch and a slip-knot. While the birds and animals are feeding, they come across the hedge, and naturally look for an opening in order to cross it. On finding one, they endeavour to pass through it, and are caught in the snare." The writer adds that "the extent of the indiscriminate slaughter under such a system can only be realised by those who have witnessed it." And if these reports were startling, the enormous extent of the export trade in plumage was equally so. During the years 1895-1900 the total quantity and value of feathers (Indian merchandise) exported by sea from India to other Foreign countries amounted to the gigantic total of 11,49,354 lbs., representing a value of Rs. 15,51,831. The details were made up as follows :—

Province from which Exported.	Quantity.	Value.
	Lbs.	Rs.
Bengal	1,69,499	6,64,942
Bombay	9,46,067	7,43,807
Sind	881	1,710
Madras	23,499	1,12,388
Burma	9,408	28,984
Total ...	11,49,354	15,51,831

The greater part of these feathers were exported to the United Kingdom and China; a considerable portion also went to Austria-Hungary, France, Germany and the Straits Settlements, and the balance was distributed in small quantities between Belgium, Japan, Arabia, Persia, etc. Nor were these the only figures which the authorities had before them at the time. It appeared that much of the export trade was also conducted through the medium of the Indian Post Office. For the period from 1st July 1898 to 30th June 1901, the records of a single Post Office, namely, that of Bombay, disclosed the facts that 1,521 parcels, containing birds' feathers of the aggregate weight of 6,813 lbs., and of the total declared value of £26,004 were despatched by the Foreign Parcel Post. Of this total number, 1,404 parcels, weighing 6,256 lbs., and valued at £23,653 were addressed to the United Kingdom, while the rest were addressed to other countries.

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With these data before them, it was obviously impossible for the authorities to view with equanimity such an intolerable state of affairs. All reports and returns showed conclusively that the trade was rapidly increasing; that birds were being killed wholesale for the sake of their plumage; and that, if prompt measures were not taken, the extermination of various species, which are to be found in India only, was imminent. Accordingly as a first step to check this indiscriminate slaughter, a Notification, No. 5028 S. R., dated the 19th September 1902, was issued, under the Sea Customs Act, 1878, (VIII of 1878), prohibiting the taking by sea or by land out of British India of skins and feathers of all birds other than domestic birds, except (*a*) feathers of ostriches, and (*b*) skins and feathers exported *bona fide* as specimens illustrative of Natural History.

As this prohibition was issued without notice or warning, a large number of representations were received, notably from a trader in Simla, who had in stock skins of Impeyans and black Argus to the value of Rs. 6,000, and from two firms in Calcutta who had in hand 6,000 skins of Impeyan and Argus pheasants, and six cases of Kingfishers' feathers, and to enable them to dispose of their stocks, and to wind up their businesses, the operation of the orders was suspended until the 1st January 1903.

Shortly after this, the attention of Government was drawn to a letter which appeared in the *Madras Mail* of the 29th June 1903, in which the writer gave prominence to the fact that no provision had been made for detecting the export of feathers and plumage by land to territories of Foreign Governments in India, such as Goa and Pondicherry. This point immediately received due attention, and with the cordial co-operation of the French and Portuguese authorities, these outlets for export were also closed.

In July of the same year (1903) a Postal Notice drawing attention of the public to the prohibition of 18th September 1902, was issued to the following effect:—

"It is hereby notified that the transmission by post out of British India of skins and feathers of all birds other than domestic birds, except (*a*) feathers of ostriches and (*b*) skins and feathers exported *bonâ fide* as specimens illustrative of Natural History is prohibited.

"2. In the case of all parcels containing birds' skins or feathers for which customs declarations are required, the name of the bird must be entered in the customs declaration; and if exemption from the above prohibition is claimed on the ground that the skins or feathers are being exported *bonâ fide* as specimens illustrative of Natural History, a statement to this effect must be made in the customs declaration, otherwise the parcel will not be accepted for transmission by post."

The trade in plumage, however, being very lucrative, the above measures were not sufficient to check it, and it appeared that export by foreign

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parcel post, under false declarations, was resorted to largely. In consequence of this, two Notifications Nos. 1819-60 and 1821-60, dated the 26th February 1907, were issued under the Indian Post Office Act, 1898 (VI of 1898), empowering certain postal officers to search, or cause search to be made, for birds' skins and feathers in course of transmission by post to any place outside British India, and making the customs declaration in respect of parcels handed to the Post Office for transmission by the Foreign post, a declaration required by the Post Office Act.

As the position in respect of the illicit traffic in plumage from India is not generally known, we have given in detail the foregoing review of the various preventative measures, taken from time to time, in this country, and it will be observed that the Indian Government have practically closed every possible channel of export. But in spite of all these prohibitions, smuggling to a large extent has commenced, and still continues. The explanatory memorandum which is prefixed to Lord Avebury's "Importation of Plumage Prohibition Bill" is most pertinent to the subject, and deserves to be quoted in full :—

"The object of this Act is to check the wanton and wholesale destruction of birds which is being carried on everywhere throughout the British Empire, and in all parts of the world, without regard to agricultural, educational and æthetic value of birds. As a proof of the extent of the destruction that at present goes on, and which is threatening the extinction of the most beautiful species, it may be mentioned that at the plume auctions held in London during the last six months of 1907 there were catalogued 19,742 skins of the birds of paradise ; 1,411 packages of the nesting plumes of the white heron (representing the feathers of nearly 115,000 birds), besides immense numbers of the feathers and skins of almost every known species of ornamental plumaged bird. At the June sale, held at the Commercial Sale Rooms, 1,386 crowned pigeons' heads were sold, while among miscellaneous bird-skins one firm of auctioneers alone catalogued over 20,000 Kingfishers. A deplorable feature of recent sales is the offer of large numbers of lyre-birds' tails and of albatross quills. The constant repetition of such figures as the above—and these plume sales take place at least every two months—shows that the Legislature must choose between the extermination or the protection of the birds in question."

The statements in the above memorandum, astounding as they may seem, are nevertheless indisputable, and the inference that may be drawn therefrom, *viz.*, that an enormous illicit trade flourishes at the present time, is fully borne out by an examination of the records of the Indian Customs Authorities. During the years 1903-1910, no less than 49 cases of smuggling were detected at the ports of Calcutta, Bombay, Madras and Burma. There were 25 cases in Calcutta, 8 in Bombay, 10 in Madras, and 6 in Burma.

A brief description of some of the more important of these cases which have been detected (in addition to the one noticed by Mr. Buckland) is not

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only interesting, but instructive as showing the methods adopted by smugglers engaged in the plume traffic :—

BENGAL.

(*a*). In April 1903 a Chinese firm were caught exporting a case of Kingfishers' skins. They were fined Rs. 1,000, and the skins were confiscated. The goods were declared as "Fishmaws."

(*b*). In October 1904, another firm were caught exporting three cases of Peacock feathers. The goods were intended for Hamburg, and were declared as "Indian curios." The firm was fined Rs. 500, and the feathers were confiscated.

(*c*). In August 1905 another Chinese firm were detected exporting 18 cases of Kingfishers' skins. They were intended for Hongkong, and were declared as "Tobacco." An examination of their books showed that since the prohibition of 1902 they had made no less than nine shipments of such goods. They were, therefore, fined Rs. 10,000.

(*d*). In the same year it came to light that a German firm in Calcutta had on various occasions smuggled consignments of Osprey, Heron and Grey Paddy Birds' feathers to the value of Rs. 22,850. They were fined Rs. 7,200. The goods were intended for London *via* Hamburg and Bremen.

(*e*). In January 1906 a Mahomedan presented a shipping bill for "three baskets of slippers," which really contained Kingfishers' skins to the value of Rs. 800. The consignment was intercepted.

(*f*). In June 1906 a consignment of five parcels, containing Osprey feathers, which had been posted in Calcutta addressed to Colombo under a misdescription "Pieces of yellow cloth" was detected. This case is a typical one, and is illustrative of the procedure sometimes adopted by smugglers. When they find it difficult to ship goods from a particular port, they send them by post, and if they wish to make sure that they will not be seized in the post, then, instead of despatching them direct to a foreign address, they post them to some small Indian port, whence they can be redespatched with less fear of detection; or else they send them to a similar intermediate destination by rail.

BOMBAY.

(*a*). During 1907-1908 two cases of smuggling of feathers occurred in this Presidency. In one case 41 packets of Egrets' feathers from Rangoon were intercepted at short intervals by the Bombay Post Office. The feathers, which were of very considerable value, were confiscated. In the other case 25 large boxes of Peacock feathers were shipped from Singapore on their way to Europe under a false shipping bill in which the contents were declared as "Country Cotton goods," and the identity of the shippers concealed. The shippers were traced with much difficulty, and severely dealt with, while the feathers were confiscated.

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(*b*). In 1908-1909 a case of attempt to export by train 823 Jungle fowl skins, with feathers complete, was detected at Castle Rock. The exporter was fined Rs. 300, and was given the option of redeeming the feathers on payment of Rs. 4,000.

MADRAS.

During the year 1907-1908 there were 10 cases of attempted exportation of Osprey feathers from the above port. The penalties imposed amounted to Rs. 3,005.

BURMA.

The only important case of smuggling of feathers reported from the above is one which occurred in 1909-1910. The goods were exported from Madras to Rangoon, but as this could not be regarded as "exportation out of British India," the matter was dealt with as a misdeclaration only, and a nominal penalty imposed.

There will doubtless be a marked diminution in cases such as those mentioned above, if, and when, the Bill prohibiting the sale of plumage and skins of certain birds, which is at present before the House of Commons, becomes law. But there seems little hope of stamping out altogether this nefarious traffic, so long as the vicious taste for wearing feathers and skins of birds by the fair sex in their head-gear continues. "Woman," says Mr. Buckland, "has come down through the ages as embodied mercy, tenderness and compassion. Sculptors have represented her with the deep, maternal breast against which tearful little children nestle for succour and comfort. Painters have depicted the poor and the oppressed fleeing to her for refuge from cruelty and wrong. Writers have given her the semblance of Venus, the peerless goddess, who, because of her solicitude for the birds, would not permit victims to be offered her or her altars to be stained with blood.

"What a travesty of this, the world's reverent ideal of womanhood, is the befeathered Herodias of modern times! Is there in the wide world a more repugnant anomaly than the spectacle of modern woman—claiming to be more tender than man—transformed, at the beck of fashion, into a creature heedlessly destructive of bird life, and in practice as blood-thirsty as the most sanguinary beast of prey? It cannot be said in apology for her sin that she errs in ignorance. So much has been written and said about the brutal methods by which her feathers are obtained that the old subterfuges have become too battered to stand. Even those soothing emollients she was wont to apply to her conscience, 'artificial' and 'moulted,' have become too impaired by constant refutations to be of further service. She knows, no one better, that art cannot reproduce a feather, and she would toss her head in high disdain if asked to wear a moulted plume."

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It would be interesting to know how the practice of wearing plumes and feathers for ornamental purposes originally arose, but it is without doubt of very ancient date. It is one of those relics of remote ages—akin to some superstitions in the religions of modern times—which in spite of its disastrous effects, still lingers, and is an outrage on every feeling of humanity. Through countless generations, man has been persistently shaking off all traces of his barbaric ancestors, and when the progress made by him is closely scrutinised, even after this enormous lapse of time, it is surprising to find that faint traces of his ancient customs still adhere to him with a wonderful tenacity. Times are, however, changing; powerful Ornithologists' Unions are at work; and the feeling is growing stronger daily that our feathered friends must be protected at all costs. Nothing short of an international law will, perhaps, ever accomplish this; but it is obvious that Governments can no longer countenance so pernicious a trade, the sole object of which is to minister for a short space of time to female vanity, or gratify the passing freak of a summer fashion at the cost of an enormous sacrifice of life. At the present time feathers, skins and other such like tawdries satisfy the demands of millinery, but when these fail, who would be bold enough to prophesy that insects with bizarre and fantastic shapes, or exotic butterflies with gorgeous colouring will not next be called into requisition to meet the demands of a new fashion? The attention of Governments of the day will doubtless then be drawn to the preservation of other species by zealous entomologists pressing for legislation in a fresh direction. But to return to the subject. It seems clear from the measures already taken that India is no longer a haunt for dealers in birds' skins and feathers, and it is high time now that they realised their precarious positions. We take this opportunity of suggesting that no heed should be paid to deputations and memorials urging absurd and frivolous objections, such as birds dropping their feathers naturally: or 1¼ millions of people being deprived of their means of livelihood; or the prohibitions not affording the least protection to birds, etc.

The points which strike us as deserving of further consideration by Government are—

(*i*). To prohibit the export of plumage from one Indian port to another (*vide* the Burma case of 1909-1910).

(*ii*). To prohibit the possession in India of birds' skins and feathers, except in reasonable quantities for personal use, or for scientific purposes only. This, it is thought, is the only measure which will ever put an end to the illicit trade so far as India is concerned at all events. For as long as there is a demand for feathers and skins, smuggling is bound to continue.

In conclusion, we venture to express a hope, and we feel confident that

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all true sportsmen and naturalists in India will join us that Government will never be induced, even by the doctrine of non-interference with trade, which is the only argument that can reasonably be urged, ever to relax the prohibitions in respect of plumage, etc., now in force. Even the more impartial student of this question could not help but view, with feelings of dismay and apprehension, the consequences of any such relaxations. For the trade which is now practically extinct would spring into renewed activity, and while causing lasting and irreparable injury by bringing about the extermination of a large number of species of birds, would eventully end by killing itself by destroying that on which it subsisted.

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THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA,

(INCLUDING THOSE MET WITH IN THE HILL STATIONS OF THE BOMBAY PRESIDENCY).

BY

T. R. BELL, I.F.S.

Part IX.

(*Continued from page* 330 *of Volume* XX.)

With Plates D¹ and D².

FAMILY—PAPILLIONIDÆ.

Only one genus .. .. PAPILIO.

There are two well marked divisions of the genus as composed of the species which interest these papers; the one composed of butterflies protected by smell and the other not. These divisions are well marked also by the form of the larvæ which, in the first, are abnormal in having the body provided with conical, fleshy tubercles not present in any of the others except one. Curiously enough, this particular one, *clytia*, has the imagines dimorphic, *i.e.*, of two forms varying in colour and general appearance, both minicking Danaine species, the one a *Euplœa*, the other a *Danais* (probably *D. limniace*); the pupa is likewise of altogether an abnormal form, looking more like a bit of dead stick than anything else. The members of the first division are *Papilio minos* (generally known as *Ornithoptera minos*), *P. hector* and *P. aristolochiæ*, of which the last two are further distinguished from all the rest by the males being without the anal claspers so conspicuous in most others of the genus.

A. Hindwing without tails or well developed tails.

a. Hindwing broad and evenly rounded with no blue band or spots on disc of upperside of both wings.

*a*¹. Size very large, 5″·5 to 7″. Forewing black, hindwing yellow .. .. .. *minos*.

*b*¹. Size 5″·5 to 6″·1. Forewing black, hindwing Cambridge-blue .. .. .. *polymnestor* (Pl. D4, figs. 27 ♂, 27*a* ♀).

*c*¹. Size 3″ to 4″·75. Underside hindwing with the marginal interspaces between the black veins yellow or orange bordered inwardly each by a black line.

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a^2. Hindwing underside end of cell dull, rich ochreous-yellow bordered inwardly by a black line. Size 3″ to 4″ .. *demoleus*. (Pl. D5, fig. 27 ♂)

b^2. Hindwing underside with the whole cell dark-brown or greyish-white.

a^3. Hindwing underside the whole cell brown. Size 4″·25 to 4″·75 .. *clytia* (form *panope*).

b^3. Hindwing underside the cell grey throughout (may have at most a fine black longitudinal streak or two). Size 4″·25 to 4″·75 .. .. .. *clytia* (form *dissimilis*).

Demoleus is a very common insect everywhere and is black in colour spotted all over with yellow.

Clytia is, as above stated, dimorphic in form, the *panope* form being the black one, the *dissimilis* form the light. There is another *Papilio* which resembles the dark form of *clytia* which may possibly be found at some hill-station for it is fairly plentiful in the Kanara District in the hills: it is *P. dravidarum* and may at once be distinguished from *clytia* by having a white spot or dot in the cell of the forewing, also by having no orange marginal spots on the underside of the hindwing.

b. Hindwing narrower, not evenly rounded: colour black with blue band and spots.

a^1. Forewing underside, with the cell unmarked. Size 3″·2 to 3″·75 .. .. .. *teredon*. (Pl. D5, fig. 30 ♂, 30*a* ♀.)

b^1. Forewing underside, the cell with four large spots in it. Size 3″·2 to 3″·5 .. *eurypylus*.

These two fast-flying butterflies have the forewing narrow and have a broad blue (sometimes with a yellow tinge) band from the apex of forewing to along the inner margin of hindwing, broken into spots towards apex: the first has, besides, only a single row of spots on the hindwing, just before the outer margin, the other has many extra spots.

B. Hindwing with prominent tails.

a. Tails narrow and parallel-sided.

a^1. Tails very long, black and white, colour more or less white all over. Size 2″·7 to 3″·75.. .. .. *nomius*.

Another species, similar to this, is found in the jungles further south than Bombay; it has two green bands across the black apex of forewing. It is *Papilio antiphates*. Size 3″·5 to 4″.

b^1. Tails short, broader, black;

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a^2. Colour upperside green and black. Size 3″·5 to 4″ .. .. *agamemnon*. (Pl. D5. fig. 29 ♂.)

The tails are, perhaps, very slightly spatulate in this species.

b^2. Colour upperside black and crimson. Size 3″·5 to 4″·75 .. .. .. *hector*. (Pl. D1, figs. 23 ♂, 23*a* ♀.)

b. Tails well developed, broad, spatulate.

a^1. Very large; colour black with large white or yellowish patch on hindwing. Size 4″25· to 5″·5 .. .. *daksha*. (Pl. D3, figs. 26 ♂, 26*a* ♀.)

There is another species similar to this in size and aspect except that the white patch is replaced by peacock blue-green; this is called *P. tamilana* and is found in the Kanara Ghats.

b^1. Smaller; forewing black, hindwing black with white discal spots and a row of sub-marginal bright red ones, especially bright on the underside. Size 3″ to 4″·5 .. *aristolochiæ*. (Pl. D1. fig. 24 ♂.)

c^1. Size of *aristolochiæ*; male black with a band of white spots across hindwing from above tail to apex, continued on to outer margin of forewing as an edge; females of three forms: one like the male, one like *P. aristolochiæ* but with brownish rose-colour instead of the red, a third somewhat like *P. hector* but the tails as in the male. Size 3″·5 to 4″ .. .. *polytes*. (Pl. D2, figs. 25 ♂, 25*a* and *b* ♀ ♀.)

There is another species, *P. demolion*, found in the Western Ghats in Kanara, &c., which is like the male of *P. polytes* except that it has two white bands to the wings; that is an extra one inside and parallel to the sub-marginal one of that species. Size 4″·3 to 4″·5.

d^1. Colour above: black with a peacock-green band across both wings.

a^2. The green band very broad. Size 4″·2 to 4″·5 .. .. *budha*.

b^2. The green band narrow. Size 4″ to 4″·6. *crino*.

These last two will not probably be found away from the hills: the first is not uncommon in the Konkan, south of Goa.

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The above table is arranged merely for reference, using easily ascertained characters only; natural affinity has no part in it. If the genus *Papilio* as constituted by the species here mentioned were to be grouped according to the relationship of its members, these groups would be as under —

Group I :—

Ornithoptera minos
Papilio hector
,, *aristolochiæ*
,, *pandiyanus*

with the larval characters as already given; the pupæ of the last two abnormal in having abdominal expansions, of *minos* quite normal. The clasper-character further distinguishes the first from the other two in the imago state. The food-plant of all three is *Aristolochia* of several species of the Family *Aristolochiaceæ*.

Group II :—

Papio clytia

already mentioned: with the larva shaped as in the foregoing, the abnormal, stick-like pupa and the food-plants *Litsea Alseodaphne, Cinnamomum*, of the Family *Laurineæ*.

Group III :—

Papilio demoleus
,, *daksha*
,, *polymnestor*
,, *polytes*
,, *dravidarum*

with the larvæ and pupæ quite normal: the young caterpillars resembling bird-droppings in colouration and pattern, quite naked; in the mature stage the colour is a rich green crossed by sullied white bands. The food-plants are all of the Family *Rutaceæ*.

Group IV :—

Papilio tamilana
,, *buddha*
,, *crino*

with larvæ and pupæ resembling the last group but nearly without markings, the latter narrower than those in that group. The food-plants are rutaceous.

Group V :—

Papilio eurypylus
,, *sarpedon*
,, *nomius.*
,, *antiphates*
,, *agamemnon*

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with larvæ of various colours, slightly spined when full grown, very heavily so in the first stage; pupæ narrow with thoracic process. Food-plants *Anonaceæ* and *Lauraceæ* (*sarpedon*).

The *Papilionidæ* are a very fairly homogeneous group of butterflies. They are found in all parts of the world being most numerous in South America. They are distinguished from other butterflies by "legs well developed; claws large and simple; no empodium; front tibiæ with a pad; metanotum free, exposed between mesanotum and abdomen." In the Indian region Bingham enumerates some 89 species of which 75 are belonging to the genus *Papilio*, the 14 others are divided into five genera: *Armandia*, *Leptocircus*, *Teinopalpus*, *Parnassius* and *Hypermnestra*. These five are confined to mountainous regions at high elevations. The *Papilionidæ* are known at home as Swallowtails because the two only species of the genus *Papilio* (the only one represented in England) ever found in the British Isles are provided with long narrow tails, one to each hindwing; the commoner being *Papilio machaon* or The Swallowtail; in early days of the eighteenth century it was called the Royal William. This home representative of the family is really scarce nowadays, though it is said to have formerly been fairly abundant in places. The other is not really a butterfly of the British Isles but it is believed has once or twice been blown over from across the Channel and caught there; even this is not quite certain. Its name is *Papilio podalirius*. Both are plentiful enough in places in France and Germany.

The family contains some of the largest and most brilliant of the butterflies. *Papilio (Ornithoptera) minos* female has been known to reach nine inches in expanse of wing, the male always averaging somewhat less. It is a butterfly of the Plains but is sure to be found in some of the Hill Stations. One of the commonest is *P. aristolochiæ* which may be seen sailing along near the ground at any time of the year anywhere in India, its tailed hindwings with their large white patch and red spots being very conspicuous. Little scarcer is the more brilliant, nearly allied *P. hector*, larger than the last, with thinner tails, white on the forewing in streaks forming a band and with much brighter red, especially on the underside, on the hindwing. The prevailing colours are black or

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very dark brown variegated with white, grey, blue, green, &c., according to the groups to which the insects belong—for even the genus *Papilio* is susceptible of division into many well-marked sections, and has been so split up by entomologists—and there are numbers of them suffused with brilliant metallic peacock-blues and greens either in large spots or all over, metallic colours which vary in shade with different angles at which the light strikes them. There are a few insects which are nearly uniformly dull, that is dark brown (with the exception of a white border to the wings, however, in every case), such as *P. clytia*, form *panope*; others again are streaked brown and grey or brown and white as *P. clytia*, form *dissimilis*; and these dull species are extremely like some of the protected members of the danaine sub-family of the *Nymphalidæ*.

This resemblance of insects without a disagreeable smell and (presumably) taste to members of a different family widely removed from them in affinity is one of the puzzles of Nature. How did it come about and why? If the *Papilios* "imitating" danaines habitually consorted with these latter or, even, if they fed upon the same plants, it might perhaps be possible to suggest some vague clue to the conundrum, psychical or material; but none of them do either one thing or other. The subject, however, is somewhat out of place here and little would be gained by discussing it, however interesting it may be.

The flight of the Swallowtails—the name is hardly applicable to many of the insects here treated of as tails are by no means present in all—is generally strong and quick, even the largest of them being capable of rapid progression. Many of them, under ordinary circumstances, sail along gently with wings outstretched, hovering over flowers now and again as the fancy seizes them, barely touching the petals with their long legs, to extract the nectar with their uncurled proboscis which, under ordinary conditions, is held safely rolled up and stowed away between the palpi. When disturbed or alarmed in any way, however, they will depart at a great pace, dodging from side to side as they go; and, when near the ground or among trees, they know how to take

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advantage of any obstacle which is likely to baffle a pursuing enemy. The larger ones, like *minos*, *polymnestor*, *daksha*, &c., keep nearly always to the protection of trees and bushes high up among the tops of the former or much lower down near the ground, skimming the verdure of the latter; others, smaller in size, more rapid in flight, amuse themselves sailing backwards and forwards over the highest trees or round the tops of hills in open country, chasing each other at intervals up into the blue sky to become mere specks in the distance; and return again to their playground. *P. clytia* is very fond of this form of amusement. The style of flight is perhaps more varied amongst the Papilios than in any other group: the same insect may sail, hover, dart and skip, though the skipping is only true of the very fast-flying species. They all without exception are fond of flowers; few of them bask in the sun: when they do so it is with outstretched wings, the upper drawn down to cover a goodly portion of the hinder ones. It is even then perhaps more to rest than to bask that they assume this position. They are very active, keep on the wing for very long periods and always seem to be busy about something. They are all fond of strong bright light and generally rest under leaves of trees in rainy weather with the wings in the same horizontal position. The weakest flier is *P. aristolochiæ*, those of the *agamemnon* group are the strongest.

These insects always lay their eggs singly, with the exception of *P. demolion* which deposits them one on top of the other in a stick of as many as 15. As a very general rule they are laid exposed on the top of a leaf or on a young shoot. They are nearly spherical in shape, slightly broader than high (this may be due to the necessarily flattened bottom where the egg rests on the leaf); quite smooth on the surface or very minutely pitted; white, green or orange in colour and sometimes blotched with reddish. In the case of *demolion* each egg is flattened on both sides where it rests on the one beneath and supports the next. The insect flutters while depositing, resting with its legs and applying the end of the abdomen to the surface.

The larva emerges by eating a hole through the egg-shell, not

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necessarily always in the same place, in a rather jagged way; it eats the shell as its first meal and then makes a bed of silk somewhere near the edge of the leaf; changing this, after it becomes bigger, for the midrib, stretched along which it always lies as in the case of the larvæ of the next family, the *Pieridæ*. It is sluggish in its movements at all periods of its existence, eats voraciously, grows fast and wanders generally before pupating. The pupa is formed against a twig or small branch, the larva lying with its head directed upwards, grasping the pad of silk, prepared before it finally comes to the quiescent state, with its claspers and encircling its body with a loop of the same, one end of which is attached to the support about two-thirds of the distance from tail to head; both the attachments are very strong. When the pupa breaks through the larval skin the cremastral hooks are wound into the tail-pad and the loop supports the downward weight—the larva having let go of the stem or twig some time before to fall back against it—in segment 4/5 as a very general rule, though, owing to same slight disturbance, the position may be somewhat displaced. As the skin of the chrysalis becomes dried by the air the part of the loop touching the body gets stuck to the surface and so keeps the whole more or less secure. In some cases the loop is very short, so that the pupa lies close up against the support with its ventral surface; in others it is long and the pupa swings freely on the tail support. The length of the loop is characteristic of the species or group.

The Swallowtail caterpiller is easy to distinguish from any other by the fact that it possesses an organ called an osmeterium (meaning the "scented wonder" or something of the sort) behind the head. It is situated on the back in the membrane between the head and the second segment and consists of a protrusible single cylindrical stem, dividing into two longly conical branches a short way from the origin, the whole thing not as long as the greatest thickness of the larva. The branches are withdrawn back into themselves from the top downwards, both finally being folded into the main stem which is then similarly drawn into itself. This organ is shiny, thin-skinned and glutinous; it is variously coloured

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in different species and emits a very strong scent or smell, somewhat pungent but not disagreeable, recalling the concentrated essence of the juices of the food-plant. The device is certainly protective though how it exactly acts on the senses of enemies it is not easy to say.

The smell, through its pungency, is almost certainly obnoxious to insect foes; for concentrated essences or vegetable juices are known to be avoided by them: witness cloves, cinnamon, lemon, lavender. The stickiness of the organs may, by actual contact with a parasitic fly or wasp of small dimensions, ward of injury; the sudden protrusion and motion of the same might possibly have a like effect in the case of larger enemies. The larvæ often strike at the part of the body menaced with the protruded organs: that much is easy to observe and has often been noted; that an attacking fly is frightened thereby has also been seen; whether the attempt is repeated by the same fly with successful issue is not known. That larvæ do get parasitised is well known. Some of the species suffer greatly in that way.

The form of papilionid caterpillars is spindle-shaped with the ends blunt or cut off square. The head is large and withdrawable under segment 2. Segment 4 is mostly thickened somewhat transversely to the length of the body and often bears a ridge in the same sense; this region is generally the broadest part of the larva. The tail end bears two tubercles of characteristic length as do very often segments 2, 3, 4 also. There are several very well characterized types of these larvæ, each representing easily distinguished divisions of the genus *Papilio*:—

Section I.—Larvæ when full grown without conical fleshy tubercles.

A. Full grown larva with the anal segment continued into two short parallel, sharply conical points, close together.

a. Full grown larva having the appearance of being transversely lined, segment 4 differently coloured to rest.

a[1]. Full grown larva black on dorsum of segment 4.. *nomius*.

b[1]. Full grown larva green on dorsum of segment 4.. *antiphates*.

These two larvæ are generally whitish in the ground colour though *nomius* is sometimes dark brown or reddy brown.

b. Full grown larva more or less concolourous.

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a^1. Lateral spine on segment 4 broadened out into a triangular tooth, white, the two connected by a crest or ridge across the dorsum .. .. *sarpedon.*

b^1. Lateral spines of segment 4 perfectly conical and sharp.

a^2. Colour green sullied with blotches of a very slightly darker shade .. .. *agamemnon.*

b^2. Colour pure green or rusty black .. *eurypylus.*

These three larvæ are all black in their first stage and are profusely covered with little branched spines which they gradually lose in the successive stages, the branches or spinules having disappeared altogether in the 4th stage.

B. Full grown larva with the anal segment not continued into such points; those points represented by mere knobs much more widely separated; the segment high, sometimes nearly perpendicular to the longitudinal axis of the rest of the body while that of the A division is nearly continuous in the same plane as that axis.

a. Full grown larva green, a prominent broad green, whitish or yellow band from dorso-ventral margin of segment 8 running up and back to hinder margin of segment 10 on dorsum or in that direction; a triangular whitish parch occupying the whole of the spiracular region of segment 10.

a^1. The full grown larva with a dorsolateral, small, conical, fleshy tubercle on segment 9 .. .. *demolion.*

b^1. The full grown larva without such tubercles.

a^2. The band on segments 8, 9 yellow-brown, spotted lighter; this band sometimes broken, irregular .. .. .. *demoleus.*

b^2. The band on segments 8, 9 green, indistinct because the same colour more or less as the larva .. .. .. *dravidarum.*

c^2. The band on segments 8, 9 with ground-colour white, sullied as a rule with grey, brown.

a^3. Full grown larva with lateral ocellus on segment 4 black, a brown line across centre and yellow-brown margin, one of the largest Papilio larvæ .. .. *daksha.*

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b^3. Full grown larva with lateral ocellus on segment 4 black, a white line across centre and bordered brown in front, blue behind, also a large larva. *polymnestor.*

c^3. Full grown larva with lateral ocellus black, not quite as above, very much smaller.. .. .. .. *polytes.*

b. Full grown larva green, not marked by bands.

a^1. The ocellus on segment 4 orange-brown, small and not well developed, the crest joining them white.. .. .. .. *tamilana.*

b^1. The ocellus on segment 4 otherwise, the crest joining them yellow.. .. .. *buddha (crino).*

Section II.—Larvæ with many conical, fleshy, pointed tubercles.

A.—Conical tubercles not red-tipped; the larva with broad creamy markings .. .. .. *clytia.*

B.—Conical tubercles red-tipped; the larva with no yellow markings; marking, if present, white or pinkish.

a. No band on segment 7.. .. .. .. *hector.*

b. A band on segment 7.

a^1. The front margin of segment 2 rosy-white .. .. *pandiyanus.*

b^1. The front margin of segment 2 not white.

a^2. Colour more or less evenly black .. *aristolochiæ.*

b^2. Colour dark rose-brown, marbled satin-grey .. .. *minos.*

Many of these larvæ are spined when they first emerge from the egg; some of them very profusely so; the spines are modified in the later stages into small conical tubercles or fleshy knobs on a few segments, disappearing completely on others; those on which they subsist always are segments 2 and 14; next on segment 4, then 9. The young larvæ of section I, sub-section B, resemble bird-droppings in their colouration; those of Section II, sub-section A also, though in a less degree.

The pupæ are also somewhat variable, though all built on the same general plan with the exception of that of *P. clytia*, alluded to before as resembling a piece of cylindrical stick with the end broken off. In the others, that of the *hector-aristolochiæ* type has dorsolateral, small, flattened expansions to some of the abdominal segments; *minos* is like the *demolius-polymnestor-polytes* form,

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with a few roughnesses on the dorsum; *tamilana-buddha* is nearly quite smooth; those of *nomius-eurypylus* have the apex of the thorax produced forwards into a blunt process. *Demolion* has the apex of the thorax produced into a curiously twisted, thin process though otherwise like *polytes*; its suspending loop is, however, very much longer than in this latter. All the pupæ wriggle when touched and produce a hissing sound; this is very noticeable in that of *minos*.

The food-plants of the caterpillars also characterise the groups. *Minos, hector, aristolochiæ pandiyanus* feed upon *Aristolochiaceæ*; *clytia*, however, affects *Laurineæ*; so does *sarpedon*; *nomius, antiphates, agamemnon, eurypylus* eat *Anonaceæ*; all the rest eat *Rutaceæ* (once *demoleus* was discovered feeding upon *Chloroxylon swietenia*, one of the *Meliaceæ*, to which family the Neem belongs). The four families consist of plants with strongly aromatic juices; but is this the only reason why the Swallowtails chose them in the past? There are probably more intimate relations between the families than the botanists allow or recognise. *Chloroxylon* is also aromatic; so is the Wild Carrot at home which feeds the larva of *P. machaon*. Carrot belongs to *Umbelliferæ*, a family quite unlike any of the above. There are, however, exceptions to every rule. The Papiliones are probably of tropical origin and when a species had to become acclimatised to more northern climes by being forced to live there, it would naturally choose food with some of the characteristics it had always been accustomed to; laurels, rues, custard-apples, *Aristolochia* are all uncommon in cold countries and so *machaon* was forced to depend upon carrot which was as good as anything else it could find. It would be interesting to know what all the species of the *Papilionidæ* of the world feed upon.

77. Papilio minos, *Cramer*.—Male *upperside*: forewing rich velvety black, pale yellowish streaks on either sides of the nerves beyond the cell; cilia short, black, alternated with pale, buffy white in the middle of the interspaces. Hindwing with the abdominal fold, the whole of interspace 1 (narrow yellowish streak of underside showing slightly in some specimens), the termen broadly, the extreme base of cell, the costal area, not extending below vein 8 except where it meets the terminal border, black; the rest of the wing rich silky yellow; the veins narrowly but prominently

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black; the inner margin of the terminal black border produced inwards into cone-shaped markings in the interspaces. Abdominal fold inside filled with a dense mass of buffy-white, scented, cottony fluff. *Underside* similar, on forewing with the pale streaks along nerves much broader; on hindwing, in interspace 1, the black is limited more or less to centre of interspace, bordered anteriorly by a yellow streak along median vein and vein 2 (sometimes very narrow at the ends or obsolescent), posteriorly by the buff-coloured outer face of fold; the lateral margins of cone-shaped projections of terminal border of interspaces 2, 3 and sometimes 4 laterally bordered, in some specimens, with yellowish extending into the black border. Antennæ, head and thorax black, the collar narrowly crimson; abdomen yellow with a lateral and lateroventral row of black spots.—Female *upperside* and *underside* similar to those in the male but with the following differences:—Forewing: the pale nerve streaks broader and more prominent, white. Hindwing: *upperside* with the black in interspace 1 sometimes strongly suffused with whitish, the streak along median vein and vein 2 white as also the border to cone-shaped marking in the latter interspace, this interspace suffused white to near base; a large postdiscal black cone-shaped spot in each interspace 2-6, the black terminal margin filling apical half of interspace 7 but interrupted at extreme apex by yellow, sometimes obsoletely; the cilia rather largely grey in the interspaces. *Underside* like upperside, the black on underside of forewing and in interspace 1 of hindwing much browner. Antennæ, head and thorax as in the male; abdomen also similar but dark brownish black above. Expanse: 150-190mm.

In both male and female the hindwing on the upperside is clothed with soft, long, brownish-black hairs from base along the dorsal area. The male is always smaller than the female.

Larva.—Head black, round from front view, moderately thick through slightly covered by segment 2. Segment 2 is flat on top with a semicircular, shiny space on the dorsum; front margin straight; immediately in front and immediately behind this shiny space is a sub-dorsal red spot; on the front margin is a lateral, long, and a marginal, shorter, fleshy tubercle. The shape of the larva is sub-cylindrical, squarish looking, the belly being more or less flat, the anal segment being about the same breadth as segment 2, and sloping much—nearly perpendicularly. Each of segments 3 to 9 are of the same size. Each of segments 3 to 14 has a sub-dorsal, fleshy longly conical tubercle, those of segments 9 and 10 being longest: these tubercles are perpendicular to the surface of the body and slightly curved forward; from the 9th and 10th segments these tubercles gradually decrease in length to segments 3 and 13; those on segment 14 are much smaller than those on the preceding segments and are mere knobs. Segments 2, 3, 4,

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5 and 14 have a similar lateral tubercle, that on segment 14 being a simple knob, that on segment 5 short, those on the other three segments being longer—the one on segment 4 is slightly longer than the other two. Besides these tubercles there is a spiracular row, on segments 2 to 14 of short ones about half as long as the lateral ones on segment 2: the spiracular tubercle on segment 14 is a mere knob and that on segment 2 is very short. On segments 2 to 13 is a small tubercle on the base of the leg or in the spot where the base of the leg ought to be. The legs are shiny black. The spiracles are longly oval and shiny black. The colour of the body is a velvety, rosey black, marbled with satiny grey on the back. On segments 7 and 8 is a diagonal rosey white band reaching from the base of the subdorsal tubercle of segment 8 to the base of the spiracular tubercle of segment 7. The subdorsal tubercle of segment 8 and the spiracular one of segment 7 are both rosey-white with red tips. All the pointed tubercles—for they are all pointed—are the same colour as the body, with bright red tips. L: 90mm; B: at broadest part (centre of the body): 15mm; H at the same place: 14mm; L of the longest tubercle: 14mm.

Pupa.—Head quadrate, top surface flat and sloping, front edge ridged, straight, with a short, triangular, round-topped projection, pointing sideways. Segment 2 has a carination separating it from segment 1, is divided into three trapeze-shaped portions which are flat, by two ridges—subdorsal—converging towards the centre of the hinder margin; slight-dorsal ridge. Thorax is convex, nearly hemispherical, with a strong dorsal carination running from front margin to apex where it divides into two curved, short, diverging ridges at right angles to each other, which latter two turn in and soon become parallel, running thus to the hinder margin. The thorax is short and the space between the two parallel ridges on its hinder slope is flat. The shoulders have a diagonal ridge running to a point towards the thorax apex. Segment 4 is in the same plane as the back slope of the thorax, the suspending string runs across its centre and behind two extraordinary waxy looking small out-growths situated on the wing-case line. The abdomen from this point to the end of segment 8 is somewhat flattened dorsally; the sides of thorax to where the suspending string passes are parallel to each other, the wing cases are expanded strongly in a curve from this point to the front of segment 8, the expansion being broadest just before the hind margin of segment 7. The abdomen from segment 9 (incl.) to the end is strongly curved down—a full quadrant of a circle—the intersegmental membrane of segments 8/9, 9/10, and 10/11 showing dorsally. Segments 8, 9, 10 have a subdorsal, laterally much flattened, contorted, pointed tooth, those on segments 8 and 9 being very large, those on segment 7 being hardly developed. From the base of each tooth of segment 9 a ridge runs to the base of the short cremaster. The ventral line of the pupa runs at first from the head parallel to hinder slope of

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thorax in a curve so that the plane at the end of wing-cases is parallel to dorsum of segments 6, 7, 8. The shape is that of *P. hector* or *aristolochiæ*. Spiracles of segment 2 in a deep hole with a thickened front margin; the rest oval, raised, colour of body. Surface somewhat rough. Colour pink-brown or green with the saddle orange or yellow, and the back of the abdomen the same as saddle; the whole surface reticulated with brown; also with smokey suffusion on the sides of ventrum. The colour of the scent-organs or "osmeterium" is orange. Antennæ and wings bordered with a thin line of black and another of red or pink. L: 50mm.: B: 20-25 mm; H: 15 mm.

Habits.—The egg is laid on the upperside of a leaf, generally on a young one, or on a shoot, sometimes on the stem of the plant and only one is deposited at a time. The butterfly hovers while depositing, holding on with the tips of the toes; the situation chosen being always dense jungles, on the side of a slight opening as often as not. The little larva lives on the undersides of the leaves—in this differing from all others with the exception of *hector*, *aristolochiæ* and *pandiyanus*, its nearest relations—in its first stages, later on it is often found on the stems and stalks, rarely on the upperside of the leaves. It is very sluggish, sits at rest much contracted like other *Papilio* larvæ and feeds hungrily mostly in the mornings and evenings. It is much parasitised by a small braconid hymenopteron or wasp which lays many eggs in its body; the little grubs, emerging, feed upon the inside of the caterpillar and come out through holes which they eat in its skin to turn into pupæ in little cocoons covered with a white or yellowish cottony wool, many together, the mass often completely hiding the body of the host. The caterpillar wanders before pupating, finally fixing itself up against a bit of stick, stalk of a leaf, stem of a plant with the usual tail fastening and a loose body-loop, generally not far off the ground. The pupa makes a loud hissing sound when disturbed by touch. The noise is produced by rubbing the abdominal segments 8, 9, 10, 11 together at the margins by a contracting motion repeated at short intervals. The butterfly emerges in the morning just after sunrise, or a little later. It has a slow, sailing flight as a rule when undisturbed but flies quickly when frightened. It is fond of flowers and frequents shady walks and glades in the jungles, keeping fairly high up,

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often, indeed, among the tree tops. It is most plentiful in the monsoon months. The females are quite as plentiful as the males at all times. The larva has been bred on *Aristolochia indica*, a weak climber with not very showy flowers and dry, expanded fruits resembling little baskets, often full of seeds, which grows plentifully in the forests and hills, from sea-level up to 2,500′ in Bombay and is found nearly throughout India; also on *Bragantia Walichii*, a shrub of the underwood in the forests of Western India, south of Goa, with leaves somewhat resembling those of Cinnamon and long thin pod-like fruits. Both these are belonging to the botanical family *Aristolochiaceæ*; the leaves of the former are locally supposed to be a certain cure for snake-bite; the roots of the latter are said to be equally efficacious in cases of cholera; the foliage of both is aromatic and smells rather nasty. The family is most largely represented in tropical America and, there, some of the flowers reach a large size and are very curiously coloured *Papilio minos* is confined to Western India from Bombay to Travancore. Three other species, similar to this, are found in British India; one of which, *P. darsius*, exist, only in Ceylon. The group contains some beautiful forms with green hindwings in the Malayan Sub-region.

78. Papilio hector. *L.* (Pl. D1., figs. 23 ♂, 23*a* ♀.)—Male *upperside* black. Forewing with a broad, white, interrupted band from the sub-costal nervure opposite the origin of veins 10 and 11, extended obliquely to the tornus and a second short preapical similar band; both bands composed of detached, irregularly indented, broad streaks in the interspaces. Hind wings with a discal, posteriorly strongly curved series of seven crimson spots followed by a sub-terminal series of crimson linules. Cilia black alternated with white. *Underside*: forewing dull brownish black, hindwing black; markings as on upperside, but the crimson spots and crescentic markings on the hindwings larger. Antennæ, thorax and base of abdomen above black; head and rest of abdomen bright crimson; beneath: palpi, sides of thorax and abdomen crimson. Female similar, the discal series of spots and sub-terminal linules much duller, pale crimson irrorated with black scales; in some specimens the anterior spots and lunules almost white barely tinged with crimson; abdomen above with the black colour extended further towards the apex. Exp. 88-120mm.

Larva.—Shape more or less cylindrical, squarish in transverse section because of the rows of tubercles which produce the effect; anal end high.

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flap nearly perpendicular to longitudinal axis of larva. The body stoutest at the segments 4 and 5. Head black, round, somewhat hidden under segment 2, shiny. Segment 2 is straight in front and on the dorsum is a dull black shield, in front of which, on the front margin, are four bright red, short, fleshy tubercles, two on each side of dorsal line and under each other; on the back margin are two more of the same sort, one on each side of the central line. Segments 3 to 13 has each a sub-dorsal, longish, conical, fleshy tubercle the same segments have also a marginal row of similar tubercles. Segments 2 to 5 have each besides a row of lateral similar tubercles, the tubercle on segment 5 being reduced to a spot. The tubercles of the subdorsal row are longest, the lateral tubercle on the 2nd segment however is longer than any and points forward, all the others being at right angles to body-surface. On the front margin of segments 8 to 12 are two subdorsal, flesh coloured spots, and on the 7th segment are two on the posterior margin, but larger, of the same colour. At the anterior base of each subdorsal tubercle on segments 6 to 14 is a spot of the same colour. On segments 8 to 11 is a lateral small spot on anterior margin, and 2 lateral on segment 7 on the posterior margin: these spots are flesh-coloured also. All the tubercles are bright red. Spiracles oval, shiny black. The two long tubercles on segment 2 are black-tipped. Colour of body is rich black-brown; the osmeterium is orange. L. 45 mm.; B: 10 mm.

Pupa.—The general shape is that of the tailed *Papilios*. Head flat in front, produced out into two sharp-edged, semi-circular, rounded, ear-like, lateral projections connected by a ridge. Segment 2 surrounded in front by a sharp, turned-up ridge; with a dip towards the centre of the segment, and then an ascent towards thorax. Thorax carinated on dorsal line, this carination splitting near centre of thorax into two sharp, rounded ridges, diverging at first, but shortly running parallel to the hind margin of segment. The thorax is convex, smooth, eared flatly and largely on the shoulder, the surface of ear facing outwards, and the ear itself directed outwards and slightly up. Segments 4 to 7 are flat on top and trapezoidal, narrower in front than behind, sloping perpendicularly on sides, then sloping out and down to edges of wings: segments 8/11 have each two large ear-like projections, one on each side of dorsal line laterally, thin and rounded, facing out and inclined outwards; the 8th segment has also a spiracular one at edge of wing. Abdomen much curved down, the dorsal line of segments 4/7 being at an angle of about 120° to the hinder slope of thorax, a somewhat greater angle than in *P. minos*; the wings are produced in the central ventral line, but not much. Surface smooth, hardly shiny. Spiracles of segment 2 situated in a round, circular depression; the rest raised, oval, dark-brown in colour. Cremaster short, strong, square at end. Colour of pupa light brown, marked on dorsum with white; it looks like brown alabaster; a whited orsa?

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line on segment 2, another, raised, on each side of this; another round the spiracular hole of same segment. L: 30mm.; B: 10mm.

Habits.—The same as *P. minos*. Young larva lives on under-sides of leaves, where the egg is laid; afterwards sometimes on stems, &c. Pupation as in that species also, the loop equally lax. The food-plant is *A. indica* also. The imago or butterfly has also very similar habits except that it does not fly so high as a rule, is very much commoner and is as much an insect of the Plains as of the jungles and hills. It is found in Bengal, Orissa, Chittagong; in the southern half of Peninsular India and Ceylon. In southern India it is one of the commonest butterflies of the Plains. The figure in the coloured plate is good. The red on the underside of hind wing is hardly bright enough.

79. Papilio aristolochiæ, *Fabr.* (Pl. D1, fig. 24.)—Male *upperside* velvety black. Forewing with well-marked, pale streaks along veins on the discal area that do not reach the terminal margin: the latter broadly velvety black; the streaks beyond end of cell extended into its apex. Hindwing with elongate, white, discal markings in interspaces 2-5 beyond the cell. In dry-weather specimens these markings are very short and do not nearly reach the bases of the interspaces; beyond these a curved series of sub-terminal, lunular markings in interspaces 1-7 dull crimson irrorated with black scales, the spot in interspace 1 large, irregular, diffuse, margined interiorly with white. *Underside* ground-colour and markings similar, but the red sub-terminal spots on the hindwing much brighter, not irrorated with black scales, better defined, the anterior four sub-quadrate, the next two crescentric, sometimes quadrate also, the spot in interspace 1 triangular and pointed. Antennæ, thorax and abdomen above to close to end black; the head, sides of prothorax above and of the whole of the thorax and abdomen beneath vermillion-red; last segment vermillion-red.—Female similar; differs from the male only in the comparatively broader wings; this is most conspicuous in the forewing. Exp. 76-114mm.

Larva.—Head black, shiny, round from front view, half hidden. Segment 2 identical with that of *P. hector*. The larva is like *P. hector* in everyway, but differs in the following points: lateral tubercle on segment 5 is absent; all tubercles are shorter and there are no flesh-coloured spots. On segment 11 is a white spot at anterior base of sub-dorsal tubercle, and an indication of one in the same position on segment 12. On segment 8 is a small white spot at posterior, and a larger one at anterior base of sub-dorsal tubercle. The posterior half of segment 7 is pure white, the border of white being irregular anteriorly, the band extending to just below spiracular tubercle, and as an included black spot between spiracular

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and subdorsal tubercles: these two tubercles are both white, being on the band: the band extends out in front from the base of the subdorsal tubercle to anterior margin of segment in a square patch, and has a small indentation on the dorsal line. The colour of scent-organs is orange. Colour otherwise the same as *P. hector*. L: 30mm; B: 8mm.

Pupa.—Exactly similar in every way to *P. hector* except that the ear-like processes are longer in proportion to the size of the pupa; the top of segment 2 is covered with a shiny red-brown colour as also the front part of the flat dorsal portion of segments 5, 6, 7. The pupa is somewhat smaller in size than that of *P. hector*.

Habits.—Identical with those of *P. hector*. Like the larva of that species, that of this is also badly parasitised by the same small wasp that attacks *P. minos*. The imago is found in N.-W. India; Sikkim; W. and S. India; Ceylon; Assam; Burma; Tannasserim; extending east to China and Siam and south to Malacca, Java and the Philippines. It is found practically all over India in the Plains and is one of the commonest of butterflies. It has a similar flight to the two preceding species though it is weaker on the wing. In the coloured figure there is too much red in the ground colour. The red on the underside of hindwing is not brilliant enough.

80. Papilio demoleus, L. (Pl. D5, fig. 28).—Male and female *upperside* black. Forewing with the base below the cell and basal half or latter so irrorated with yellow scales as to form more or less complete, transverse, dotted lines; two outwardly oblique, yellow spots in cell and a curved spot at its upper apex; a spot at base and another beyond it in interspace 8; a discal, transverse series of cream-yellow spots, irregular in arrangement and size, extends from interspace is 1*a* to 8; the series interrupted in interspace 5 and the spot in interspace 7 double; this is followed by a similar, postdiscal series of spots and an admarginal, terminal series of smaller spots. In many specimens, between the discal and postdiscal series the black ground-colour is irrorated with yellowish scales. Hindwing base, and edging that decreases in width along the dorsal margin, irrorated with yellow scales; followed by a broad, medial, yellow, irregular band, a sinuous, postdiscal series of outwardly emarginate, yellow spots and a terminal series of smaller, similarly coloured spots as on the forewing. The inner margin of the medial band is curved inwards, the outer margin is very irregular and uneven; in the cell the band does not reach the apex, but beyond the cell there are one or more cream-yellow spots and the black ground-colour is irrorated with yellowish scales; finally at the tornal angle there is an oval, ochraceous-red spot emarginate on its inner side in the

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female and in both sexes surmounted by a blue lunule; while in interspace 7, between the medial band and the postdiscal spot, there is a large ocellus-like spot of the black ground-colour more or less irrorated with blue scales. *Underside*: ground-colour similar, the cream-coloured markings paler and conspicuously larger. The latter differ from those on the upperside as follows:—Forewing: Basal half of cell and base of wing below it with cream-coloured streaks that coalesce at base; irregular ochraceous spots in interspace 5-8 and a discal series of spots complete, not interrupted in interspace 5. Hindwing: The black at base of wing and along the dorsal margin centred largely with pale cream-colour; the ocellus in interspace 7, the apex of the cell and the black ground-colour between the medial band and postdiscal markings in interspaces 2-6 centred with ochraceous margined with blue. Antennæ dark reddish-brown, touched with ochraceous or the inner side towards the club; head, thorax and abdomen dusky black; the head and thorax anteriorly streaked with cream-yellow; beneath: the palpi, thorax and abdomen cream-yellow with lateral longitudinal black lines on the last. Exp. 80-100mm.

Larva.—Head round, flattish in front nearly hidden under segment 2 in repose, light brown in colour. Segment 2 saddle-shaped, four-sided, cut square off in front, with a small short, fleshy protuberance at each front corner; the front margin of segment is as broad as the head and it gradually increases in breadth posteriorly. Segment 3 nearly twice as broad as segment 2, broader behind than in front, convex. Segments 4 and 5 are the thickest part of the body and are swollen, the anterior margin of segment 4 and posterior of segment 5 being thickened slightly and coloured yellow-brown, the yellow-brown colour on segment 4 reaching only half way down the side, bordered thinly with black and with a series of loops composed of thin black lines and a circular black eye-like mark at each extremely crossed transversely by a light blue line. The hinder margin of segment 5 has some dark spots on the yellow-brown part, this yellow-brown part reaching down the sides half way. Segments 4 and 5—the green part—are broad on top and very much narrower on sides. Segment 6 is slightly smaller in transverse section than segment 5 and the rest of the segments decrease in order in transverse section to the anal segment which is in a plane nearly perpendicular to the others. There is a pair of subdorsal points on segment 12 pointing out horizontally backwards. All the upper part of body is yellow-green with a broadish, greasy-looking white, spiracular band to them. The perpendicular part of the anal segment is whitish. The anterior margin of segment 6 and posterior margin of segment 5—that is the connecting membranes of those two segments—is whitey-black. The white spiracular line on body only reaches from segment 5 to end, and the green-dorsal part of segments 2 to

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5 is bordered narrowly with a curved black line, and does not reach the base of the legs, the part below, as well as abdomen and legs, being a dirty transparent white. On segments 8 and 9 is a diagonal band reaching from centre of segment 9 near dorsum to the anterior margin of segment 8 at white, spiracular, marginal line: this band is irregular in contour and coloured yellow-brown, spotted with lighter colour. There is a patch similar in colour to this band at posterior lower margin of segment 10, and two small, similarly coloured spots on hind margin of same on each side of dorsal line. Prolegs large and fleshy. The bands are sometimes obsolescent, osmetria flesh coloured. L: 33mm; B: 7mm.

Pupa.—Head like *pamon* or *daksha* with two projections out in front, these projections short, broad, diverging, toothed slightly on the inside, ridged on top, and separated widely and squarely by a sharp ridge forming the front margin of head. Front of head-segment is sloping, hind margin is flat. Segment 2 is broad and flatly concave on top. Thorax is parallel-sided, shoulders being slightly prominent, the front dorsal slope nearly perpendicular to plane of segment 2, this front slope being overhung by the apex which is produced into a short, square-topped projection; from the top of this projection two ridges diverge to the back margin of thorax—slight ridges—between which the surface is flat transversely, although longitudinally slightly convex. The sides of thorax are slightly convex. The abdomen, dorsally on segments 4 to 8, is rather flat, the wing expansions are very slight, so that the pupa at segment 7 is very little broader than at the shoulders. The abdomen is cylindrical in section, except the last two segments which are square. The cremaster ends off square and is rather broad. There are a pair of very small tubercles at the base of each of the head projections on the top of the head, and a subdorsal one on each of the segments 8 to 11. The projection of the ventral line of junction of the wing cases is accentuated, and broadly parabolic. The surface of each wing-case is flat. The inclination of the dorsal line of the first four segments to the rest is about 120°. Spiracles oval, small, inconspicuous, raised, sunk in pits. Surface very finely but moderately deeply pitted all over. The colour is generally green with a more or less great quantity of yellow marking dorsally on abdomen; when the pupa is formed in a cage and not among leaves it is generally different shades of browns and greys. L: 30mm.; B: 10mm.

Habits.—The egg is laid on the top surface of a leaf. The young caterpillar that emerges is one of those that, from the next stage on until the last but one, imitates a bird-dropping; it is somewhat yellower in shade than that of *P. polytes*. The pupa is formed on the underside of a leaf, against a stalk or twig, &c., and the loop is rather short that supports it. It is a good deal

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slighter for its length than that of *P. polytes*. The larva is very much parasitised and does not use the osmeterium much. The butterfly has a very quick and strong flight and is always hurrying along whenever met with like, *P. machaon* at home, though it is a faster flier than this latter. It does not rise very much above the ground and is fond of flowers and the sun; it is commoner in the Plains than in the jungles and hills and may be seen on the wing throughout the year. Its range is Kashmir to Ceylon; eastwards to Burma up to a moderate elevation in the hills; westwards to Persia; it is found also in China and Formosa. The food-plants are belonging to the family Rutaceæ and it has been bred on *Ruta graveolens*, L.; *Glycosmis pentaphylla*, Correa; *Murraya koenigii*, Sprengler; *Citrus decumana*, L.; *Aegle Marmelos*, Correa; all rutaceous; on *Chloroxylon swietenia* DC., one of the *Meliaceæ*. The last food-plant is very exceptional and the larvæ did not look very healthy that were found on it. *C. swietenia* looks at first sight rather like a leguminous tree and this most probably led to a statement made in "Notes on the Larvæ and Pupæ of some of the Bombay Butterflies" by E.H.A. that it had been found on "leguminous plant with aromatic leaves." In that paper, published in this Journal in the year 1896, the butterfly is called *P. erithonius*. The figure on the coloured plate is good.

(To be continued.)

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A SURVEY OF THE MAMMALIAN FAUNA OF INDIA, BURMA AND CEYLON.

Up to 1891, Naturalists in India had to rely for information on Mammals to Dr. Jerdon's "Mammals of India," a delightful book with many interesting notes on the habits of the different animals, but sadly wanting in details of distribution, and completeness in descriptions. This was through no fault of the author, but owing to lack of good collections and the paucity of information. At this time practically the only collections of Indian Mammals of any importance were in the Indian Museum at Calcutta and the British Museum in London. For observations over and above his own, the author relied on those of Colonel Sykes, Sir Walter Elliot, Brian Hodgson, Colonel Tickell, Major Hutton, Horsfield, Blyth and Kelaart, all of whom had made collections and published notes and papers in various journals and proceedings.

Some years later, namely, in 1884, R. A. Sterndale published his "Natural History of Indian Mammalia," a purely popular work not adding much to Jerdon's however.

A few years before Sterndale's work was published, namely, in 1881, a memorial prepared by Dr. P. L. Sclater, then Secretary to the Zoological Society, and signed by Darwin, Hooker, Huxley and other well known Scientists, was presented to the Secretary of State for India. In the memorial it was recommended that a series of volumes dealing with the Fauna of India should be prepared and that Dr. Blanford be appointed as editor. The outcome of this memorial was that in June 1888 the first part of the first volume of the series was published. This dealt with the Mammals as far as the Insectivora (Shrews and Bats), but it was not till 1891 that the second part completing the Mammals was published. The delay was caused by Dr. Blanford having to edit

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other volumes in the series on birds, fishes and reptiles. Since 1891 this volume has been the standard work on Indian Mammals.

A glance through Dr. Blanford's book, the Mammals of the Indian Region, will show that there is still plenty of work to be done amongst Indian Mammals, even amongst the commonest species. Much has still to be learnt of the habits and distribution of nearly all the Mammals and from the want of specimens, in more than one case, several species were united under one name. This want has also hindered the study of the extent to which the different species vary.

As an instance of our ignorance of the distribution of some common animals it may be mentioned that the exact range and where they meet of the three kinds of Langur monkey, *i.e.*, the Langur, the Madras Langur, and the Himalayan Langur is still unknown.

Amongst the smaller carnivora, we find that the Waved Cat was supposed to have been originally obtained from Nepal and since then specimens have been obtained in as far distant localities as Kashmir and Rajputana. To this information Dr. Blanford adds :— "This cat must therefore be widely dispersed through Northern India, though it does not appear to be common." The Brown Palm-Civet is only known with certainty from the Palni and Nilgiri Hills, but Dr. Blanford suggests that it also probably inhabits the higher ranges of Cochin and Travancore. This has not been proved yet.

Though many people do not know it, a Marten closely allied to the Indian Marten, *Mustila flavigula*, is found in Southern India in the Nilgiri and Travancore Hills. In a paper on the Indian Marten published some years ago by Mr. J. L. Bonhote, the distribution of this Southern Indian race was given as the Peninsula of India!

When the Fauna was published it was thought that four Otters were found in India, but since then Mr. O. Thomas has pointed out that there are in reality only three, the Common Otter and the Himalayan Otter being the same. The distribution of these three

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Otters is still very badly known, and though an otter is supposed to inhabit Ceylon it is not known to which species it belongs.

In a recent number of the Journal Mr. Wroughton pointed out how little was known also in regard to the species and distribution of the Hedgehogs of India and practically nothing of their habits.

Years ago the Rev. H. Baker reported, in the Journal of the Asiatic Society of Bengal, that he had found in Malabar some black-velvet-coated animals which he supposed were moles. His description sounds as if the animal was mole-like, but no moles are known to inhabit that part of India.

Of the thirteen white-toothed Shrews recorded in India, Burma, etc., one is found in only one locality and two known only from single specimens. The Assam short-tailed Shrew is likewise only known from a single specimen. In "Notes on Jerdon" Colonel McMaster mentions seeing a black Shrew swimming in a stream near Nagpur. No water shrew is known south of the Himalayas so it is impossible to say to what species this Shrew belongs.

Coming to the bats we find that according to Blanford there are 95 species, of which 12 are known from single specimens and 7 others from only one locality. Several new species have been described since 1891, and many additions made to our knowledge of their distribution.

Even the range of such common animals as the Common and Black-naped hares is wanting, and from information recently received it seems as if, there was a variety of the last-named was confined to parts of Southern India. Of that interesting animal the Hispid Hare, found along the foot of the Himalayas and in Assam, hardly any thing is known regarding its habits. The exact range of the common Mouse Deer or Indian Chevrotain is imperfectly known, and the study of a large series of skins from all parts of India would, in all probability, lead to some interesting results. The same might also be said of the wild Pig about which we have more to learn than many people imagine.

To try and remedy the above defects, the Committee of our Society have decided to undertake a survey of the Mammals of India, Burma and Ceylon, and recently issued an appeal to members

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for funds to enable them to employ two or more trained European Collectors to make a collection of the Mammals of India, Burma and Ceylon, all over the country, and in anticipation of obtaining the necessary money they commenced by engaging the services of Mr. C. A. Crump who collected for several years with Colonel Ward in Kashmir.

The sum, which it has been estimated, will be required for the purposes of this scheme to maintain two Collectors for two years only is Rs. 30,000 (£ 2,000), which can hardly be considered a large sum when we consider the enormous expanse to be covered and the great value the results of the work will be to Zoology in India.

In recent years a few volunteers have sent in specimens particularly Colonel Ward, Major Dunn, Major Magrath and Captain Whitehead, but it is recognised that the European in this country, whether in Military or Civil employ, has neither the time nor opportunity to collect Mammals and that the only way in which such work can be satisfactorily done is by the employment of trained men for the purpose. Mr. Oldfield Thomas, in charge of the Mammal Department at the British Museum (Natural History), South Kensington, fully supports our scheme and has agreed to identify all specimens for our Society and to describe any new species or varieties in our Journal.

At present, until sufficient funds are forthcoming, the Society dare not employ more than the one Collector, but it will be a regrettable thing if this is not speedily altered, and if only the money was obtainable the Society has at the present moment the chance of obtaining the services of Mr. Shortridge, as he has been recently invalided home from the New Guinea Expedition.

A good many members and others in Burma and elsewhere have kindly offered to help our Collectors when they visit their districts, and this assistance is greatly appreciated, but more money must be obtained if the scheme is not to fall through.

The Society has some 1,500 Members on its Register, and if only each member would contribute Rs. 10 a year for two years this would guarantee the whole sum.

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The following subscriptions have been promised :—

Mr. G. M. Ryan	Rs.	100
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Received since 15th April ..	Rs.	1,565	0	0
Total received up to 30th April ..	Rs.	12,473	15	8

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REVIEW.

AN INTRODUCTION TO BIOLOGY FOR STUDENTS IN INDIA.

BY

R. E. LLOYD, CAPT., I.M.S.

[*Longmans & Co. Price Rs. 4.*]

Teachers of Natural History all over India will cordially welcome this work which, with the exception of a small book by Powell, is the first attempt to adapt the teaching of Animal Biology to the local conditions and needs of the Indian student.

The first eight chapters are devoted to excellent descriptions of Indian examples of most of the Invertebrate sub-kingdoms. These examples are for the most part easily obtainable and have been selected with judgment. No vertebrate or vegetable organism is described, nor do we think there is any great necessity to describe the vertebrates, as so many English text-books give satisfactory descriptions of types easily obtainable in India.

The last four chapters are good but brief essays on the principles of Biology, Evolution, Variation and Heredity, which are however mainly illustrated by facts in vegetable and vertebrate organisms.

There are few points in the book which call for further criticism than warm praise. For instance, we are told that "*Distoma* is not common in India." Ten years ago we never had any difficulty in finding it in Calcutta. In Eastern Bengal this parasite has at times caused us personally pecuniary loss, and seemed to us to be present in the majority of apparently healthy sheep and goats.

We are surprised to learn that *Euglena* cannot be easily obtained in Calcutta. The author's description of the Earthworm *Pheretima (Perichæta) posthuma* differs in many particulars from the older account by Powell; thus the dorsal pores are said to occur between each segment; the vasa deferentia on each side are said not to unite, but run separately side by side till they reach the "prostatic" duct. We have examined six specimens since reading Capt. Lloyd's book, and found the ducts unite in all six cases in the 12th segment. Perhaps Capt. Lloyd's description was taken from an aberrant specimen, or possibly the worm of Calcutta differs from that of Bombay. Lloyd describes as the "crop" the thick walled organ usually called the "gizzard."

We do not quite appreciate what he describes as "the œsophageal glands." The drawing shows these glands in the situation of what Powell has described as "mop-shaped or compound nephridia." These structures are undoubtedly nephridia. The name "œsophageal glands" has already been given to well recognised structures of totally different homology.

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Few will agree with the author's account of the thorax of the mosquito. He regards the scutellum as representing the whole of the mesonotum and all anterior to it "more than three-quarters of the whole" thoracic terga as the pronotum.

On page 180 we read "In a European species of cockroach the *males* are wingless"—an obvious slip of the pen for *females*. But why European? Is not *S. orientalis* all too common in India?

One or two sentences might perhaps be better worded, for example page IX—"Science is our united experience of material things *as expressed in books*." On page 2, "Bacteria which have emerged from minute round bodies called spores, just as a chicken emerges from its egg."

These are small faults easily rectified in future editions. The book as a whole will be a great assistance to both teacher and student.

A. POWELL.

INDIAN EARTHWORMS AND THEIR DISTRIBUTION.

W. Michaelsen, "The Oligochæta of India, Nepal, Ceylon, Burma and the Andaman Isles," *Mem. Ind. Mus.*, vol. i, pp. 101-253 (1909), and "Die Oligochatenfauna der vorderindisch-ceylonischen Region," *Abhandl. Naturwissen. Verein, in Hamburg*, Band xix, Heft 5, pp. 1-107 (1910).

In the two papers to which a reference is given Dr. W. Michaelsen, of the Hamburg Natural History Museum, the author of the admirable volume on the Oligochæta in "Das Tierreich," discusses the taxonomy and distribution of the earthworms of India and Ceylon and of their allies, the minute aquatic species of the families Aeolosomatidæ, Naididæ and Tubificidæ. his investigations being based mainly on the collections preserved in the Indian Museum. In his last paper he recognizes 177 species of Oligochæta as occurring in India (including Nepal, Burma and the Andamans) and Ceylon. Of these, 24 species belong to the aquatic families, 1 species (*Henlea lefroyi*, Beddard) is parasitic in habits, and 152 are true earthworms. The aquatic Oligochæta exhibit many interesting features as regards habits and structure,* but with few exceptions they have an extremely wide distribution, the same species often occurring in all geographical regions. They are therefore of less geographical interest than the true earthworms.

Dr. Michaelsen divides the earthworms, considering them from a geographical point of view, into two categories, "endemic" and "peregrine" species, the latter being species which accompany man in his wanderings and are introduced with garden plants and the like into the country sur-

* As regards the Indian species see Stephenson's papers (*Mem. Ind. Mus.*, Vol. i, pp. 255-281 ; *Rec. Ind. Mus.*, vol. i, pp. 133 and 233 (1907) ; vol. ii, p. 39 (1908) ; vol iii, p 105 (1909) ; vol. v, pp. 59, 233 and 241 (1910).

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rounding human habitations. He regards 31 of the species found in India and Ceylon as peregrine and a considerable number as of doubtful origin, but the great majority he asserts to be endemic in the strict sense of the word. It may be noted, however, that while the earthworms of Bengal, certain parts of the Himalayas and Madras, the plains of Travancore and of the United Provinces are now pretty well known, those of the Bombay Presidency have still been very imperfectly collected and studied.

In the first of his two papers Dr. Michaelsen states that the Indian Empire and Ceylon may be divided, so far as the earthworms are concerned, into three geographical regions, a North Indian Region, a South Indian-Ceylon Region, and an Indo-Malayan Region. The last is of course not confined by the political boundaries of the Indian Empire but extends eastwards and southwards into Malaysia. So far as our fauna is concerned it includes only Burma and the Andaman Islands. The North Indian Region includes all India north of a line drawn from west to east "somewhat north of the latitude of Madras." The South Indian-Ceylon Region is divided into two sub-regions, the South Indian and the Ceylon Sub-region. With a few exceptions the earthworms of the Western Himalayas, as well as all those known from the Punjab, are Palæarctic species, but Dr. Michaelsen considers them to be peregrine, and is apparently prepared to deny that there are any indigenous earthworms in North-Western India. As some of the specimens he has examined come from localities in the Western Himalayas far from any human dwelling, and as the many other elements (*e.g.*, the Diptera) in the fauna of the same localities are Palæarctic, it is difficult to accept this verdict as final. A different view is taken by Beddard as regards the earthworms of Gilgit.*

Dr. Michaelsen is an enthusiast on behalf of the earthworms. "The endemic terrestrial Oligochætes," he writes, "give us one of the best documents for the geological history of a country." He evokes a chain of islands between New Zealand and the Eastern Himalayas to afford a passage for the westward march of the Octochætinæ, and when it is no longer needed for the use of these favoured creatures, dismisses it beneath the sea. We may not be able to follow him in such flights, but it is impossible to avoid recognition of the laborious and accurate work that forms their starting point. All Indian naturalists must be grateful to him for his researches on a group that has hitherto been much neglected in this country but possesses a real geographical importance.—N. A.

* "They are entirely European, *i.e.*, Palæarctic species: they belong, in fact, to the usual British forms. This is of interest, as being an approximation to discovering the limits of the Oriental region for worms": Beddard in Alcock's *Report on the Natural History Results of the Pamir Boundary Commission*, p. 45 (Calcutta, 1898).

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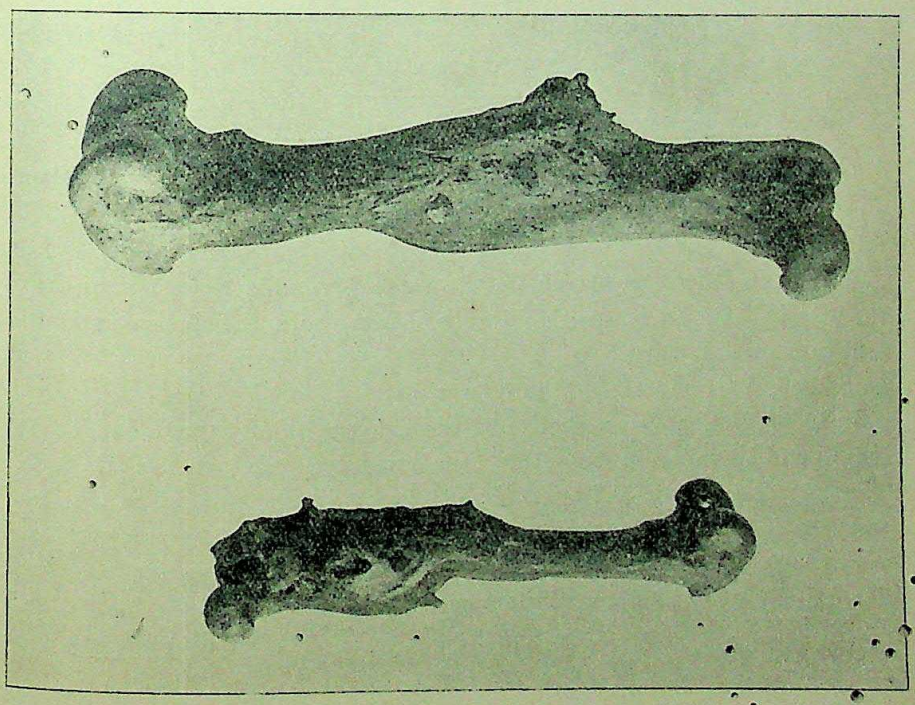
MISCELLANEOUS NOTES.

No. 1.—VITALITY OF A WOUNDED TIGER.

In March 1888 I was out in the banks of the Kosi where it leaves Nepal. On the 19th March I fired at a tiger as he disappeared into the jungle and hit him over the left kidney, he could not be followed that evening as it was almost dark. On the 21st he was put up and fired at. On the 24th he was seen, also on the 28th. On the 30th he was put up and killed by a bullet through the skull. One of the party got off his elephant and on to the pad elephant to help in putting up the dead tiger. He was not long at work when he was seen to leap off wildly and begin vomiting and remarked that the stench from a wound in the tiger's back was awful and that it was the tiger I had wounded a week ago. A *post mortem* was made—my bullet had struck the spine just above the left kidney, breaking up the kidney, part of the liver, the whole of the left lung and the pericardial sac was filled with blood, the side of the spine was deeply scraped for about 3 inches and the last rib broken.

W. FORSYTH.

PEN ITHON HALL, NEWTOWN, N. WALES,
4th January 1911.



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No. II.—OLD WOUNDS IN TIGER AND PANTHER.

The accompanying illustration is from a photograph of the left and right *femur* of a tiger and panther respectively, shot by myself. It will be noticed that they have both been fractured but have re-united, making of course in each case one hind leg shorter than the other. In the case of the tiger, I was unable to ascertain how the bone (the larger one in the photograph) had been fractured, but in the case of the panther the injury had, no doubt, been caused by a bullet, as I found no less than three old bullets in its body. The tiger too had probably been wounded in the same way although there were no signs to show this. Both animals must, at the time of the injuries, have had considerable difficulty in obtaining their *natural* food if indeed they were not quite incapacitated from doing so. It is at such a time that tigers and panthers are supposed to take to man-eating as being the easiest way of satisfying their hunger, but I can confidently say that neither of these animals were man-eaters. The panther was an exceptionally fine one and measured 7 feet 8 inches in length. It had killed two or three of my young buffaloes before I shot it. There is room for much conjecture.

MARSH HALL, SOUTH MOLTON, N. DEVON. L. L. FENTON,
30th October 1910. LT.-COL.

[Our Society has in its museum a somewhat similar specimen to the above being the tibia and fibula of a tiger shot by Lt.-Col. G. H. S. Gimlette, I.M.S at Rewah, C.I., some years ago. Major Gimlette when sending the specimen remarked that the tiger when shot was going quite soundly and showed no sign lameness. The bullet, if we remember rightly, was still in the leg bone.—EDS.]

No. III.—THE NUMBER OF CUBS IN A TIGER'S LITTER.

In March 1887 I was out on the banks of the Kosi after tiger, when a tigress was shot. On examination it was found that the uterus held 5 fœtus.

In 1888, on the 31st March, on the same ground a tigress was shot, the uterus held 5 fœtus within a work of being born, the skins were to be sent to Rowlend Ward.

In 1887, 7 tigers were shot in 6 days.

In 1888, 21 tigers were shot in 31 days, over ground some 20 miles in length and 10 miles in breadth. This ground is partly in British India Territory and partly in Nepal. It is a great grazing ground in the hot weather and tigers follow the herds and in addition hog-deer and pig are very common, so tigers are well fed and their procreative powers are well developed. We came several times on a tigress and 3 cubs.

PEN ITHON HALL, NEWTON, N. WALES, W. FORSYTH.
4th January 1911.

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No. IV.—SAMBUR AND TIGER.

A short account of the behaviour of a sambur doe whilst I was waiting for tiger the other day may be of interest.

When some men went out to bring in one of my tied-up buffaloes about 7 A. M. they were unable to approach on account of tigers growling; the buffalo had not then been touched but when I arrived at 8 A. M. the buffalo had been killed and partly eaten. I sat over it from 1 P. M. Soon after that hour, I heard roars every fifteen or twenty minutes and the sharp clarion call of a sambur hind sounding from almost exactly the place from which the roars and other noises made by the tigers were coming.

The doe or hind stuck gamely and continuously to her enemies and never once appeared to leave them all the long afternoon, frequently uttering her bugle-like note of alarm. I could trace the gradual advance of the tigers towards the kill, till at last the doe's bell sounded quite close and almost immediately two fine tigers stepped into view. I killed one with a shot through the heart and the other disappeared. The doe however continued calling loudly for some time notwithstanding the shot fired so close to her. Had she a fawn near?

Why did the tigers not molest her?

H. W. SETON-KARR.

November 1910.

No. V.—FOOD OF SAMBUR.

Last September I was out Pykara way—that is west of Ooty—I was much interested in noting that the sambur had eaten, and in large quantities, the common Nilgiri nettle—*Girandinia teterophy*, etc. This nettle has large species on the leaves and ordinary clothes are no protection when working through it. The irritation lasts for some time and is very painful. It seems strange food for an animal and this in the wet weather or here there is any quantity of food of all sorts in the jungles and on the hill-sides. There is no mistake about the sambur having eaten this plant, the ground all round the plants was trodden down, and the foot marks were quite distinct. I drew the attention of two friends who were with me at the time to this, and though both of them have been in this part for many years (*i.e.*, in Pykara) and are most observant, this is the first occasion on which they have seen the nettle eaten by sambur, or any animal.

CHAS. GRAY.

ORCHARD DENE,
COONOOR, *November 8th*, 1910.

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No. VI.—ABNORMAL NUMBER OF YOUNG IN A MARKHOR.

Whilst up in the Chilias district I was in the Rakhiot nullah shooting. On the 21st June I was on the hill-side between Rakhiot and Jalipur Nullahs which overlooks the Indus, trying for a good Oorial. I got a nice one of 28½ inches and later whilst searching for others saw a very interesting sight. This was a female Markhor, sitting on a high rock in the middle of the fir jungle, with three small kids lying beside her. I watched them for a long time. Every now and again the old female would get up and look round for danger, when the little kids had a great struggle so as not to be left without a drink of mother's milk. I was well above them and so was able to approach moderately close without being seen. I was very supprised to see them where they were as the ground was not like markhor holding ground though there was some about a mile and a half further along the hill-side.

The local people I had with me were both well known local shikaries and said that it was the first time they had either seen or heard of markhor producing three kids at one time though tame goats not infrequently do so. They also had never seen markhor so far outside the nullah and away from their usual haunts.

JHANSI,
August 16th, 1910.

J. A. POTTINGER,
30th Punjabis.

No. VII.—NEW INDIAN BATS.

In the *Annals and Magazine of Natural History* for December 1910 Dr. Knud Anderson describes ten new Fruit-bats among which is a racial form of *cynopterus sphinx*=*C. marginatus* of the Fauna of B. I., the short-nosed Fruit-bat. This race Dr. Anderson calls *C. sphinx gangeticus* destinguishing it from *C. S. sphinx* by its larger size. He remarks that this bat *C. sphinx* "falls into two well-marked races. The smaller *C. s. sphinx* ranges from Ceylon northward along the western side of the Peninsula at least as far as Bombay, and along the whole of the eastern side to Bengal, Assam, and N. Siam (in Asam and N. Shan it meets the extreme northern outpost of *C. brachyotis angulatus*). The larger *C. s. gangeticus* is probably generally distributed over the North-Western and Central Provinces of India, but so far identified only from Lucknow and Nasik."

The type was collected by Major A. S. Begbie at Lucknow and was presented to the British Museum by the Society.

In the same magazine for February 1911 Mr. Oldfield Thomas gives the description of new species of long-eared bat collected by C. A. Crump at Leh, Ladak. The bat is named *Plecotus wardi* after the donor Col. A. E. Ward. It is distinguishable from *P. homochrous* and *P. puck* by a broader skull and paler colour.

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No. VIII.—GREAT INDIAN FIN WHALE NEAR RATNAGIRI.

On the 9th of January the Society received information from the Collector of Salt for the Bombay Presidency of a large whale having been washed ashore near Viziadrug in the Ratnagiri district, some miles south of Bombay. Mr. C. Crump, the Society's Mammal Collector, was at once despatched to Viziadrug, but unfortunately when he arrived there he found the whale had gone to pieces, only a few bones remaining. He, however, secured several blades of baleen, the largest of which measured $14\frac{3}{4}''$ broad at the base and 22 inches in length. In colour the baleen was a uniform black. The whale was said to have measured between 68 and 70 feet and probably therefore was an example of the Great Indian Fin Whale (*Balænoptera indica*).

In volume XVII of this Journal the stranding of a large whale—said to be 63 feet in length—at Bassein on April 11th, 1906, was recorded. In both cases, owing to the delay in information reaching the Society, chances have been lost of correctly determining the colour of this large whale. Through the kindness of the late Mr. Wood, I. C. S., instructions have been issued to the various officers of the Salt Department near Bombay to immediately report by telegram to the Society any large whale which may be washed ashore.

BOMBAY NAT. HIST. SOC., N. B. KINNEAR.
March 1911.

No. IX.—THE RUFOUS-BACKED SPARROW (*PASSER PYRRHONOTUS*, BLYTH).

In the *Fauna of British India*, Vol. II, p. 238, the distribution of this bird is given as 'Bahâwalpur; the Eastern Nára, Sind." Since then it has been recorded from Lahore [Journal, B. N. H. S., XIX, 259]. It may therefore be of interest to record that on February 19th of this year I met with a flock of small birds, which proved to belong to this species, in some trees on the R. Sutlej side of Ludhiana. The behaviour of the birds reminded me of a flock of Siskins or Redpolls, and I shot one, fully expecting to find it to be one of those birds. But on picking up a male sparrow that was new to me, I shot a second bird and it too was a male of the same kind. The birds were tame and cared little for the gun, merely flying a few yards and then continuing their busy search for food. Their notes were low and sweet.

A few days later, on the 2nd of March, I shot a solitary female in a small grove of trees at Phillaur on the other side of the river.

RAWAL PINDI, H. WHISTLER,
November 29th, 1910. Indian Police.

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No. X.—THE HIMALAYAN GREENFINCH (*HYPACANTHIS SPINOIDES*).

With reference to Mr. Dodsworth's enquiry in the last Journal, I may mention that I have observed Himalayan Greenfinches at Kurseong (6,000 feet), Eastern Himalayas, from early in October to late in December.

KURSEONG, 20*th December* 1910. E. A. D'ABREU, F. Z. S.

No. XI.—BLYTH'S BAZA (*BAZA JERDONI*).

I was much interested in Mr. D'Abreu's note of the occurrence of *Baza jerdoni* at Kurseong which appeared in the last Journal (No. 2, Vol. XX). I may mention that the bird is not excessively rare in this part of the district (reputed elevation 1,200 ft. to 2,000 ft.) and Mr. C. M. Inglis while staying with me shot a fine adult at the beginning of the year. I have frequently seen others while going round the garden since then and to-day came across four of these birds. One of these settled close by and from its elongated and at the time half-erected crest was unmistakable. On my pointing my stick at it, it joined three others that were soaring round within easy shot. I may mention this is the only occasion on which I have ever seen it in more than pairs, though *B. lophotes* (The Black-crested Baza) is not very rarely met in threes, fours and even up to five in a party, the latter being presumably two adult birds and the young of the season. I took a clutch (three) of the latter birds' eggs in the early rains from a sal tree, the nest being about 25 feet from the ground. These are now in Mr. Inglis's collection. I had great hopes of obtaining eggs of *B. jerdoni* as well, but the birds deserted the tree in which they showed favourable signs of breeding. However I hope to be more successful next year. The Nepalis consider both the Bazas common birds and have one name for both. *Microhierax eutolmus* (The Red-legged Falconet)—of which I have shown them four specimens—they consider an unknown bird!

I may add in conclusion that to a casual observer *B. jerdoni* may be readily mistaken for *Lophospizias trivirgatus* (The Crested Goshawk), the coloration of both birds being very similar.

LONGVIEW TEA ESTATE, ALEX M. PRIMROSE.
PUNKABARY P. O., D. H. RY.,
29*th November* 1910.

No. XII.—SECOND OCCURRENCE OF THE EUROPEAN GREAT BUSTARD (*OTIS TARDA*) IN INDIA.

On the 5th instant I sent you by registered letter post a skin of what I make out to be the Great (European) Bustard (*Otis tarda*), an immature female.

It was shot by a Zamindar near Jacobabad on Sunday, 1st January 1911,

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out of a party of four. They had been about the village for some days in the gram and mustard fields. I had not heard of them or I should have gone out to try to watch them. I saw them flying round on the Sunday morning when out pigsticking, but could not tell then that they were anything out of the ordinary.

The Zamindar tells me that they used to fly around on the evenings. They have not been seen since this one was shot. All four were about the same size. The man's father tells me that a bird like it was shot here about 25 years ago, but whether that was another *Otis tarda* or not it is impossible to say. All the people about here recognise this as a Bustard but all agree it is a strange.

Would you please let me know if this is a specimen of *Otis tarda*, as I see the only one previously recorded was shot near Marden 40 years ago.

LARKHANA, SIND,
8th January 1911.

M. H. SIMONDS, CAPT.,
7th Hariana Lancers.

The above skin was sent to Mr. Stuart Baker, who writes as follows:—

It is now almost exactly forty years ago that Hume through his collectors obtained the first specimen of the Great Bustard ever obtained in India. This bird was killed on the 23rd December 1870 at Mardan, north of the Kabul River, and was one of a small party feeding in some mustard fields.

A second specimen of this magnificent bird has now been obtained by Captain M. H. Simonds at Jacobabad, Sind. This bird, like Hume's, is a young female adult and Captain Simonds has recorded the following notes as to its measurements, &c.:—Length 31·5″; tail 8″; wing 19·25″; tarsus 4·5″; bill from gape 2·75″; weight, after cleaning, 5 lbs."

The weight of the uncleaned bird, fresh, we may estimate at about 8 lbs. The wing in its dry state is just over 19″ and the bill from tip to feather of forehead is 1·38″. The tarsus if measured at the side from joint to joint is 4·30″; mid toe, including claw, 2·41″.

The rufous pectoral land, which in the male extends across the heart, is well developed in this female on both sides of the heart, though hidden to a great extent by the superlying grey feathers.

DACCA, 13*th March* 1911. E. C. STUART BAKER.

No. XIII.—THE EUROPEAN BUSTARD (*OTIS TARDA*) IN NORTHERN INDIA.

I am sending you a wing and foot of a great European Bustard, two of which were shot by a Daffadar of the 15th Lancers on the 8th instant, between this place and Mardan.

Seven of these rare visitors have been seen near here during the last fortnight, and I have been out after them several times but could not get

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near them. I am sorry I cannot send a whole skin as the man hallaled them very badly.

In North China I once saw a large number of both the Great Indian and European Bustard on the same ground, and it was very interesting to note the difference between them; the Great Indian Bustard were always scattered when feeding, and rose and flew independently like Houbara, but the European ones did not separate so much when on the ground, and rose and flew together more like geese, although, of course, not in V formation. This habit of the Great Indian Bustard of feeding apart can often be turned to good account when stalking them if riding on a camel you disturb one of the outside birds, so that it does not fly very far. Then you lie down in a direct line between the solitary bird and the rest of the flock and send your camel round to disturb the latter who will nearly always fly to join their companion and often give an easy shot, as they do not fly high.

It was very cold in the north of India about Christmas, the thermometer falling to within ½ a degree of the record which accounts for their presence here, and also for some Mute and Bewicke Swans which were shot on the Kabul river near here last week.

We do a great deal of hawking here specially Houbara, and it is the greatest ambition to kill an European Bustard with a Saker Falcon, but up to now no flight has been obtained after them.

I see from Hume and Marshal that it is just 40 years since an European Bustard was killed in India, and that one was then shot at the same place as these were. It is very doubtful if they will ever be seen here again, as most of the ground will in a few years be under cultivation by means of the Malakand canal. Both the birds killed were females and weighed 9½ lbs. each.

RISALPUR, *9th January* 1911. H. FOOKS, LIEUT.-COL., I.M.S.

No. XIV.—LITTLE BUSTARD *(OTIS TETRAX)* IN KASHMIR.

I am sending you by Post a skin of what I believe to be the *Otis tetrax* or Lesser Bustard. This is the second of these birds, which has been shot in Kashmir during the last 12 months. This one was shot by Major Smith near the Woolar Lake.

SRINAGAR, *16th November* 1910. F. J. MITCHELL.

[In Volume XVII, p. 945, Col. A. E. Ward recorded a Little Bustard which was obtained near Hajan, Kashmir, in December 1906.—Eds.]

No. XV.—WEIGHTS OF NILGIRI WOODCOCK.

I notice in an article under the heading "Woodcock Shooting in the Nilgiris" in Vol. XX, No. 3, page 854, that it is stated that the heaviest bird known to have been killed on the Nilgiris turned the scale at 14½

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ounces and was shot in March. In reference to this statement, it may perhaps be worth mentioning that in February 1901, I killed a Woodcock outside Ootacamund that weighed exactly 16 ounces. I weighed it several times to make sure, and finally sent to the local taxidermist, Mr. Van-Ingen to have it set up, as it was certainly the finest bird I had ever seen.

H. R. BAKER, MAJOR,
73rd Carnatic Infantry.

CANNANORE, 11*th February* 1911.

No. XVI—OCCURRENCE OF THE GREAT SNIPE (*GALLINAGO MAJOR*) NEAR BANGALORE.

On the 28th October 1910, a specimen of *Gallinago major*, the Great, a Double Snipe was obtained by Capt. A. Boxwell, of the 119th Infantry, near Bangalore, this being the second record of its appearance in India. This specimen is that of a very young bird, probably of a late June hatching, and is remarkable for the amount of colouring in the outer tail, feathers, exceptional even for a bird of this age. It is, however, easily distinguishable from the Fan-tail by its great size and from our other large snipe, *solitaria* and *nemoricola*, by the shape of its tail feathers. From *solitaria* it also differs in its much shorter wing and from nemoricola in the comparative length of primaries and secondaries. From *megala* and *stenura* it can be separated at once merely by a glance at its tail feathers, none of which are attenuated.

Capt. Boxwell writes concerning this specimen in a forwarding letter and a subsequent note as follows :—

"The bird weighed 7 ounces. It got up from a piece of loose mud on the edge of a stream which divided some sugar-cane from a rice-field."

"It made no noise as it got up except the flutter of its wings which I thought was more noticeable than that made as a rule by a snipe, but I did not realize that it was not an ordinary snipe till its size on the snipe stick drew my attention."

E. C. STUART BAKER, F.L.S.,
F.Z.S., M.B.O.U.

DACCA,
30*th December* 1910.

No. XVII.—MUTE SWAN (*CYGNUS OLOR*) ON THE MEKRAN COAST.

At 6-30 A.M. on the 11th of February my cook Abdul Aziz informed me that two geese had settled on the Kalingi-Ab, about half a mile from the Telegraph Concession. I was too ill to go myself, so roused Mr. Griffiths, of the Indo-European Telegraph Department, who occupies the same rooms. He dressed and took his double barrelled gun with him. The ground adjoining the abovementioned patch of water affords no cover, so Mr. Griffiths, therefore, took a few cartridges containing ball. He fired at the birds from a distance of about 100 yards, hitting the male bird through

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the neck and slightly winging the female with the same ball. She, however, rose and flew slowly over Mr. Griffiths who shot her.

The birds turned out to be Swans, and were identified with the assistance of Captain White, 117th Mahrattas, as being Mute Swans *Cygnus olor* and tallied in every respect with the description in *Indian Ducks and their allies*. The male was pure white, but the female was a very light lead grey on the back, and must, therefore, have been an immature bird. Abdul Aziz is a well recognised shikari in these parts, his experience extending well over thirty years, but he has not seen such birds in the neighbourhood of Jashk before.

JASHK,
23rd February 1911.

F. G. STEINHOFF,
Medical Officer, Indo-European Telegraphs.

[As far as we are aware this is the first record of this Swan in Persia, but it is known to occur in Egypt, Arabia, Asia Minor, Afghanistan and N.-W. India. Eds.]

NO. XVIII.—THE DWARF GOOSE, *ANSER ERYTHROPUS*, NEAR FYZABAD.

To-day whilst on the river Gogra, which flows past here, I came across a flock of geese, amongst which I noticed four very much smaller birds than the usual Indian geese. Later on in the day I very luckily came across this flock for a second time and managed to bring to bag one (I think a female) of these smaller birds.

Looking up its description in *Indian Ducks and their allies*, I came to the conclusion it must be a "Dwarf Goose." I am sending the skin down to you for identification—unfortunately in skinning, the man entrusted with the work cut off the legs, wings and beak, which will spoil it for the specimen I intended it to be.

FYZABAD,
23rd February 1911.

G. H. PLINSTON,
XI Rajputs.

[The remains of the bird are those of a Dwarf Goose, an uncommon species in India, though according to Blanford it is common in Persia where it breeds—EDS.]

No. XIX.—NOTES ON DUCKS AT KOHAT.

I am sending you by parcel post to-day a skin of a female stiff-tailed duck, *Erismatura leucocephala* as I see from "*Indian Ducks and their allies*" that this is considered a rare bird, and thought you might care to have the skin. I shot it a few days ago on a large tank in the salt range near Lilla, and I saw about 20 more at least; another man in my Regiment, who was shooting further west also shot two, and I saw a lot more, so it appears this duck is not so rare as is frequently supposed.

I also noticed a large number of the common Sheldrake, *Tadorna cornuta* and shot one. Neither of these two ducks have I ever seen before in this

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country. The Smew, *Mergus albellus* was present on this tank, too, in big flocks, and I shot two of them and found them not bad eating after being kept several days.

I see it says in Stuart Baker's book that it is exceptional to find the Smew in large flocks. I noticed one big flight of over a 100 birds one evening.

KOHAT,
January 1911.

W. M. LOGAN HOME,
112th Infantry.

No. XX.—BIRDS NESTING IN THE NILA VALLEY (GARHWAL).

The following notes may be of interest as some of the nests and eggs, I believe, have not been described before. The Nila stream joins the Bhaghirathi at Searsic at about 8,000 feet elevation and the valley runs up to the Nila Pass, on crossing which one descends into the Sutlej drainage: the valley being at the back of the first snowy range is protected from the full force of the monsoon, and although there was plenty of rain and mist, the atmosphere was fairly dry, even at the end of July.

Graculus eremita.—Red-billed Chough.—I found a nest in a crevice of a cliff at an elevation of 8,800 feet on April 25th, made of deodar twigs and thickly lined with wool; it contained four fresh eggs of a whitish ground colour, thickly spotted with yellowish brown and purplish grey. It being at rather a low elevation for the Chough to build. I secured the female and within 48 hours the male had brought another mate, who actually sat in the nest for some hours; they ultimately, however, abandoned it. There were two other pairs breeding not far off, but in an inaccessible place.

Lophophanes rufinuchalis.—Simla Black Tit.—These birds I found very common from 8,000 up to 11,000 feet; they appear to build invariably in a hole in the ground, usually under a stone or root, and except when building it is practically impossible to find the nests, as they are usually in most unlikely looking holes. It is also not easy to hit off the right time to get a full clutch of fresh eggs, as they have an exasperating habit of carrying in wool long after the eggs have been laid, and I lost two clutches by their being hard-set when dug out, however five nests with fresh eggs were secured, and many were seen with young in May. The nest is a mere pad of wool with a little moss and is placed sometimes two feet from the entrance; the eggs seen were much less spotted than most tits and four seems the full clutch, at least I never saw more, either of eggs or young.

Tribura thoracia.—Spotted Bush Warbler.—This bird breeds fairly commonly in the Valley at about 12,000 feet, and a good many nests were seen in June and July: they are domed and placed on the ground in a tuft of grass or among thick herbage, and are made entirely of dry grass with usually a single feather as a lining, I only twice saw two feathers used and never more. The full clutch seems to be four, but commonly three only are

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laid: the eggs are longer in shape and much less speckled than those of *Tribura luteiventris* or *Tribura mandellii*.

Merula maxima.—Central Asian Black-bird.—Several pairs were seen at 13,000 feet and over, and several nests with young, the eggs must have been laid early in May, when the whole place was under deep snow. However, I was lucky enough to find one pair building in June and on the 21st got a fine clutch of four from the nest, securing the birds. Their dimensions are somewhat larger than given in the Birds of India, the male being 12 inches long, wing 6·25, tarsus 1·55, bill from gape 1·25 and the eggs are larger than those I have seem from Cashmere. All the nests seen were massive structures of dry herbage and grass with a little earth on the foundation and very thickly lined with fine grass. They were all placed on ledges of rock, sometimes quite unconcealed, but the birds were very wary in approaching them. It is curious that the existence of this bird should have been overlooked in these parts, as it is fairly common and much in evidence, both from its frequenting the open and from its rattling alarm call.

Adelura cæruleicephala.—Blue-headed Robin.—I got three nests of this bird, each with four fresh eggs, or from 10 to 11,000 feet in the last fortnight of May. They were all placed in banks and concealed by drooping grasses. The eggs are as described by Wardlaw Ramsay of a dull cream colour with a darker zone. The birds are very wary, while building the male appearing to be always on guard, anyhow I never saw him assisting in building: the female sits very close, once the eggs are laid, and we could never find a nest by searching, the only chance was to find a pair building, which was not at all easy, and I consider these nests as among the most difficult to find. Great numbers of these birds were passing up the Bhaghirathi Valley in April, and it would seem they do not all remain to breed in these valleys.

Ruticilla frontalis.—Blue-fronted Redstart.—This was a common nest from 11 to 13,000 feet; it has, of course, been recorded before, but I found one nest building in a cavity in a birch tree, quite 20 feet up, and on June 5th, I took the eggs (3) and secured the bird, it being such an unusual position for the nest of this bird, all the numerous nests I have seen having been on the ground, usually sheltered by an overhanging bank, stone, or grass tuft.

Grandala cœlicolor.—Hodgson's Grandala.—On July 15th we found a nest with two young at 16,700 feet, it was placed under a ledge of rock at the top of a snow bank and was very neatly built of fine moss with a lining of feathers, a rather large nest, 9 inches across, internally 3¼ inches. The eggs must have been laid by June 15th, when the place would have been inaccessible from snow. The nest was discovered by seeing the female catching little white moths in the grass and flying off with them, but it

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took several days as she went up fully 1,500 feet to her nest and the mist (which was incessant over 14,000 feet) made it very difficult to follow her. I kept the young alive for six days on white moths and ants' eggs when they died very suddenly. One other nest with two young was seen. Up to June 25th these birds were about in small flocks of from 5 to 10, feeding at 14,000 and some of them must have been building at that time fully 2,000 feet above their feeding grounds, so it would seem they do not separate into pairs when building, and this makes the nest more difficult to find.

Accentor nepalensis.—Eastern Alpine Accentor.—Two nests were found with two and three eggs on June 27th and July 4th both in precisely similar situations, being placed well under flat stones, at nearly 15,000 feet. The nests were beautifully made of moss throughout, no other material being used. The eggs were, of course, blue and unspotted. Later on several nests with young were seen. The dimensions of several specimens I secured are much less than those given in the Birds of India, all I measured being 6 inches in length with a wing of 3·3 as against 7 inches and 4 inches, and it would almost seem that this is a smaller race.

Propasser thura.—White-browed Rose Finch.—Two nests of this bird were taken at 13,000 feet at the end of July, the nests were placed low down in juniper bushes and built solidly of dry grass with an inner lining of hair. The eggs are clear greenish blue, sparingly spotted with black, not with brownish grey as mentioned by Mandelli. The clutch appears to be four.

Propasser ambiguus.—Hume's Rose Finch.—Two nests were found at 12,000 feet, and I watched the birds building from a few yards off. The nest and eggs do not differ from those of *Propasser pulcherrimus* and the females are practically inseparable, though *ambiguus* is slightly the smaller, the specimens I got being 5·6 in length with a wing of 2·8, and I never got a female *pulcherrimus* under 5·8 in length with a wing under 3·0.

Propasser pulcherrimus.—Beautiful Rose Finch.—This bird was exceedingly common, and I saw over 30 nests, all placed low down in prickly bushes and made of dry grass and lined with hair. The clutch was usually four, but sometimes five and many full clutches were laid by July 20th. The hen sits very close and can be examined on the nest once the full clutch is laid, until then she is wary enough.

Propasser rhodochrous.—Pink-browed Rose Finch.—This species was not so common as *pulcherrimus*, but a good many nests were seen. I should consider the eggs of *ambiguus*, *pulcherrimus* and *rhodochrous* as quite inseparable, a clear greenish blue with black spots, but *rhodochrous* is easily recognised on the nest by the broad supercilium, which shows up well while the bird is sitting.

Fringillauda sordida.—Stoliczka's Mountain Finch.—This was a common

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breeder at 13,000 feet and over. The nests are of dry grass lined with hair and always placed in a hole in the ground. The full clutch appears to be four; the bird can frequently be caught on the nest as she sits very close. I do not think this bird has been recorded as breeding in these parts before, though, of course, it has been from Cashmere and elsewhere.

Besides the Grandala, I was unfortunate in finding nests with young only of *Pyrrhospiza punicea*, the Red-breasted Rose-Finch; *Tichodroma muraria*, the Wall-creeper; and *Buteo ferox*, the Long-legged Buzzard; of other nests of interest, which however have been recorded before from other parts, we got *Lerwa nivicola*, the Snow-Partridge; *Cephalopyrus flammiceps*, the Fire-cap; *Larvivora brunnea*, the Siberian Blue Chat; *Turdus viscivorus*, the Missel-Thrush; *Sitta leucopsis*, the White-cheeked Nuthatch; *Oreocincla dixoni*, the Long-tailed Mountain Thrush; *Accipiter nisus*, Sparrow Hawk; *Chelidorhynx hypoxanthum*, the Yellow-bellied Flycatcher; *Pycnorhamphus carneipes*, the White-winged Grosbeak; *Horornis pallidus*, the Pale Bush-Warbler, and *Anorthura nepalensis*, the Nepal Wren.

BAREILLY, *December* 1910. S. L. WHYMPER.

No. XXI.—THE BROAD SNOUTED MUGGER IN THE INDUS.

A fallacy that numbered me among its victims until quite recently was that of the non-existence in the Punjab rivers of the broad-snouted mugger, *i.e.*, either *Crocodilus porosus* or *palustris*, the variety *Gavialus gangeticus*, or fish-eating crocodile, is of course common. Formerly I had supposed that this latter species was the only one to be found in the Indus or its tributaries, and from questioning other sportsmen it appeared that I was by no means the only one to hold these views. Quoting from the *Indian Field Shikar Book*, it being the only reliable work in which I have found any reference to the crocodile, we learn that *Crocodilus prosus* inhabits the rivers of Bengal, the East Coast of India and Burma, whilst the habitat of *palustris* is practically the same as that of *porosus*. So there would seem to be fair excuse for my former supposition.

During a three years' sojourn in Dehra Ismail Khan, I never heard of such a thing as a broad-snouted crocodile in the Indus. Though, I shot not a few fish-eaters and spent many days after them. In October last I proceeded on a boating trip downstream, and in due course of time arrived opposite the formerly important town of Leiah, some sixty miles as the crow flies from my starting point. The boatmen had already excited my curiosity by accounts of some broad-snouted crocodiles, which lived in a "dhand" or sluggish tributary of the Indus close to Leiah. They said there was a regular colony of these brutes living in this place, the larger ones measuring 10-12 feet in length and the smaller ones anything down to 3 or 4 feet; that they had taken several people during the last four years or so, besides occasional goats, sheep, &c., and that they were

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only to be found in this "dhand" and never in the main river. As sport had hitherto been rather poor, I resolved to go and look up these muggers, though I was sceptical of their existence.

We arrived at last at about 4-30 p. m. at the place where the guide said that the muggers were most often seen. The "dhand" here was some 30 yards broad with banks from 10 to 15 feet high covered here and there with clumps of long grass and small bushes. The water subsequently proved to be very deep, the banks seeming almost vertical except at certain well-marked fords. I was gazing at what looked like a piece of driftwood in the water, when it slowly sank and re-appeared a few yards further on, proving the existence of one mugger, anyway. Shortly afterwards the shikari spotted one on the bank opposite us. He was lying in the middle of some rushes, and was so well hidden that I could scarcely make out anything without my glasses, although the distance was only about 40 yards. The mugger did not move in the slightest, while we were watching him and appeared to be quite used to men, and I finally shot him through the neck. A local fisherman, who was with us, volunteered to swim across and tow the mugger back, a feat which he performed without any difficulty, although there were certainly more muggers in the water close by. The mugger proved to be a well-conditioned little beast of 5 feet 6 inches with a girth of 24½ inches, and on skinning him we found him to be covered with fat. Natives keep this fat for use as an embrocation, and we took twice as much of this off him as off any fisheater I have ever shot. The reason for this is that the stream swarms with various sorts of fish, moving up to 15 lbs. or more, and these evidently provide the muggers with an easy and inexhaustible supply of food.

Although I stayed at this place until the following afternoon, I did not succeed in bagging another, though I killed a fish-eater of about 11 feet, and also blew up the head of a mugger of quite 10 feet, which rose to the surface of the water close to me. Neither of these corpses were retrieved. It was apparently very lucky to find the small one out on the bank, as the people told me that the broad-fronted muggers seldom came out to bask, though they often float on the top of the water. I very much regret that I did not count the teeth of this crocodile, so the question of the genus being *palustris* or *porosus* still remains to be decided. The local name for the broad-snouted mugger, by the way, is ("baghori") Urdu باغون the fish-eater being known as "măggăr," măggăr mach or "sansăr" usually the latter. "Gharial," the native name attributed to *Gavialus gangeticus* in the *Indian Field Shikar Book*, is unknown on the Indus, and I have yet to meet a native who understands it.

Can anyone solve the problem of how these crocodiles get into that "dhand?" They are unknown in the main stream, although the "dhand"

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leads directly into the Indus. They have been there now some 4 or 5 years according to local accounts.

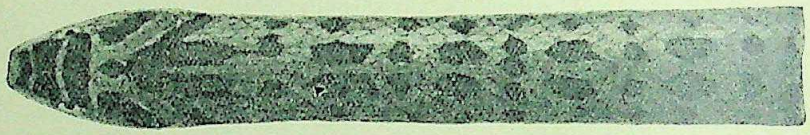
The accompanying photos are disappointing, as the sole of films turned out to be a bad one. They show, however, the mugger, and also the dhand" where he lived.

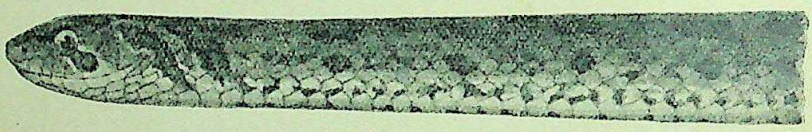
R. FRANCIS, LIEUT.,
47th Sikhs.

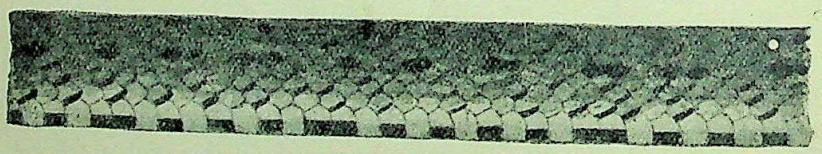
JULLUNDER, *25th January* 1911.

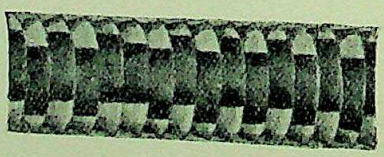
[The name "gharial" is probably a Ganges or Brahmaputra name. The broad-snouted crocodile was probably *C. palustris*, which is the common one on the West Coast of India, *vide* Boulenger's *Reptilia Fauna of British India* Series.—EDS.]

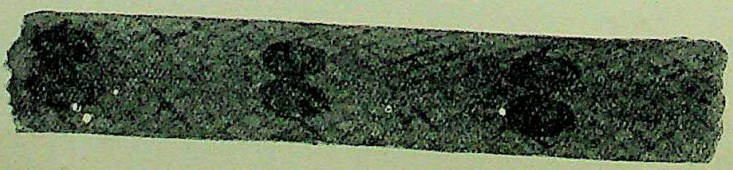
No. XXII.—A NEW SNAKE *SIMOTES JUGLANDIFER* HITHERTO UNRECOGNISED AS A DISTINCT SPECIES.











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In a previous issue of this Journal (Vol. XIX, pp. 3 and 8) under the name *Simotes albocinctus*. Variety *juglandifer* I commented upon a snake which has up to the present time been considered merely a colour variety of the species *albocinctus*.

I remarked that this form appears so different in its markings from the typical variety of *albocinctus*, that to those unacquainted with ophiology the two would certainly be taken to be different species. The fact that after a repeated and critical examination of the two, side by side, I could discover no difference in the lepidosis, compelled me as it had done others before me, to accept the view that *juglandifer* was merely a colour variety of *albocinctus*.

I have now, however, evidence to put forward to claim for the former the rank of a species distinct from *albocinctus*. I find that in *juglandifer* there are short edentulous spaces anteriorly and posteriorly in the palatine bone: the former would accommodate one tooth, and the latter two or three. In *albocinctus* there is no space anteriorly, and a short space that might accommodate one tooth posteriorly. In both species there is a slight interval in the pterygoid bone anteriorly that might take a single tooth, and in both the maxilla and mandibles are toothed to their extreme anterior limits. As will be seen from the synopsis of dentition from three skulls of each in my collection, there are rather fewer palatine teeth in *juglandifer*.

The fact that the lepidosis in the two appears to be identical makes a detailed description of this unnecessary, but in colours and markings the two are very distinct. *Albocinctus* is usually reddish or dark-brown dorsally with light, black-edged crossbars. *Juglandifer* is dark-brown dorsally, and has a series of peculiarly shaped marks reminding one of the kernel of a walnut running down the back, just like those seen in *L. splendidus* and *oligodon venustus*. These marks are sometimes completely bisected by the masial anterior and posterior indentations. Sometimes too there are broken crossbars in the intervals as shown in figure 1 of our Plate. Both appear to grow to a similar length.

Both species occur in the Eastern Himalayas and the Assam (Khasi) Hills. I have found *albocinctus* in the Assam Plains at Dibrugarh.

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Though not very uncommon *juglandifer* is not nearly so numerous as *albocinctus*. The dentition of the two in my specimens is as follows :—

Specimen.	Habitat.	Side of head.	Maxillary.	Palatine.	Pterygoid.	Mandibular.	Species.
a	Dibrugarh	Left.	10	8	19	16	*albocinctus.*
		Right.	11	9	19	15	Var. *typica.*
b	Dibrugarh	Left.	10	9?	18	13	Do.
		Right.	10	9?	19?	14	
c	Pashok (East Himalayas).	Left.	11	7	17	15	Do.
		Right.	10	8	?	15	
d	Tindharia (East Himalayas).	Left.	12	7?	17?	13	*juglandifer.*
		Right.	11	7	18	13?	
e	Ditto ..	Left.	10	6	17(18?)	15	Do.
		Right.	10	7	17(18?)	15	
f	Pashok or Tindharia.	Left.	10?	6(7?)	16(17?)	17	Do.
		Right.	10	6(7?)	17	17	

F. WALL, C.M.Z.S.,
MAJOR, I.M.S.

CHITRAL, 15*th March* 1910.

No. XXIII.—NOTES ON THE COLOUR OF THE COMMON KEELBACK.

Major Wall in his article on the *Macropisthodon plumbicolor* refers to Cantor's descriptive word "plumbicolor" as misleading, and states that the Common Keelback is always some shade of green. This, of course, is perfectly true of the dorsal and costal scales, but the ventrals in all the young I have examined not a great number, unfortunately have been the exact colour of plumbago, and for them plumbicolor is a most apt descriptive word.

I should like very much to know whether young keelbacks are always found with plumbaginous belly scales.

If it is owing to the charasteristic, I have mentioned that Cantor used

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the word "plumbicolor" his choice is unfortunate for the descriptive word should apply to some evident, permanent characteristic, while as far as I have observed the keelbacks, the plumbaginous belly scales disappear with age.

T. M. EVANS.

PANCHGANI, *7th January* 1911.

No. XXIV.—MOSQUITOS AND FISH.

The fact that fish devour the larva of mosquitos has attracted the attention of several observers in Bengal in recent years. At first sight this habit of fish does not appear to be of much significance. Mosquitos and fish as well as malarial parasites have all been living in Bengal for some time past. But the fish have become important in this connection, because of certain circumstances which are believed to appertain to the island of Barbadoes.

It is said that there is no malaria in Barbadoes, because there are no mosquitos there. Mosquitos cannot live because all the fresh waters are swarming with a small fish called "the millions," which would devour the larvæ if they were present. It is evident that the millions do not devour mosquito larvæ in Barbadoes, they have not the opportunity.

The absence of malaria and mosquitos and the presence of "the millions" may, for the sake of discussion, be called the narrative concerning malaria in Barbadoes. There is no reason so far as I know for believing that this narrative is untrue, but it is evident that before any steps are taken in India to fight malaria by means of fish, we ought to be quite sure that it is true.

If the narrative is true, there is something very remarkable about the fish called "millions." In nature there is a balance between the numbers of any species and the amount of food that is available for their nutrition. Population is diminished by famine and increased by plenty, this is no less true of fish. A given volume of natural water cannot support more than a certain weight of fish.

If then the fresh waters of Barbadoes are constantly swarming with a particular kind of fish, that kind of fish must have some special source of nutriment. Most fresh waters in the world contain fish but not in swarms. If the millions are able to live in swarms in any kind of tropical pond, it is evident that they ought to be introduced into malarial regions.

But it is most unlikely that a species of fish can exist in vast numbers in any kind of fresh water, if it has this power it must have a special method of extracting nitrogenous food out of pond water, a secret which it does not share with other animals. The suggestion has been made that in Bengal the fish *Hapochilus panchax* should be encouraged to play the part of the

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Barbadoes "millions," on the assumption, of course, that the narrative concerning the latter is strictly true. But it is unnecessary to stock tanks in Bengal with *Hapochilus*, for they are already stocked to a large extent. It was recently stated in one of the daily papers that the waters of some of the colliery districts in Bengal were to be stocked with *Haplochilus* in order to lessen malaria. Before money is spent on such a venture, it would be well to enquire whether those waters are not already supporting as many small fish as possible. It cannot be dogmatically asserted that every tank in Bengal contains *Haplochilus*, but fish of this kind are certainly as common and as widely distributed in Bengal as sticklebacks in England. In either case if we were to find that a long existent pond was devoid of small fish, we should strongly suspect that such were unable to live in that particular pond.

The statement has been made that since the introduction of *Haplochilus* into the waters of the Zoological Gardens at Alipore, the larvæ of mosquitos can no longer be found there. This is a misleading and even a harmful statement, for it might well induce people to spend money in stocking ponds which are already stocked with *Haplochilus*. Mosquito larvæ are still to be found in the tanks at Alipore, and the *Haplochilus* was there before the time of its alleged introduction. I myself saw it there in 1907. It is sometimes spoken of by observant children as the fish with the white topee.

R. E. LLOYD, CAPT., I.M.S.

CALCUTTA, 13*th February*, 1911.

No. XXV.—NOTE ON THE BUG, *ASPONGOPUS JANUS*.

During a recent tour in the Southern districts of the Bombay Presidency I happened to spend a day (October 29th) in the town of Bagalkot in the Bijapur district,—and very quickly noticed that the streets seemed to be alive with the immature forms of a pentatomid bug—*Aspongopus janus*. These were crawling about the road in almost every street and lane through which we passed, on the roads leading from the town, and along the railway line near Bagalkot station. Not a single adult form was noticed on the ground in this position, but on examining one of the very common large malvaceous weeds round the town, *Abutilon muticum*, the adult bugs of the same species, were found in very large numbers. Several individuals were found on almost every plant, feeding on both the young shoots and the older leaves. The results of their feeding on the plant did not appear serious, and only a slight shrivelling and curling up of the younger leaves was noticed.

The difference between the appearance of the adult and immature insects in this case is sufficiently striking to be figured, and the appearance

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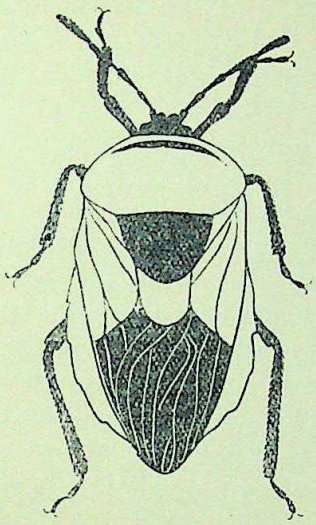
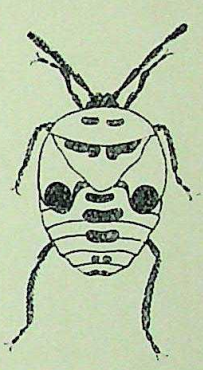
of the two is shown below. The unshaded portion is in both cases an orange red, though the tint varies much in different specimens, and the shaded part black. The figures are illustrated twice the natural size (×2).



Adult.



Immature.

From the same plant (*Abutilon muticum*) at the same time and place, I obtained several other bugs, and the fact that this is a food-plant for each of them is worth noting.

1. *Nezara graminea*, originally described as feeding on gramineous plants, but recorded from Bombay as found on *Gynandropsis pentaphylla* (Dixon).

2. *Dysdercus cingulatus*.—The so-called red cotton bug.

3. *Oxycarenus lactus*.

The immature bugs of this species were present in immense numbers, almost every plant giving a considerable number. A few adults were caught, but as the insect is a fairly active flier, it would naturally not be obtained to the same extent. This insect has already been noticed attacking the seed capsules of other *malvaceous* plants. Green records it on *Abutilon asiaticum* in Ceylon and Dixon on *Gossypium stocksii* in Bombay.

HAROLD H. MANN.

POONA, 10*th November*, 1910.

No. XXVI.—FEROCITY OF FEMALE MANTIS.

In the note on the "Food of a Mantis" (Journal, Vol. XX, No. 3, p. 878), your correspondent records the case of a female mantis eating the male during the act of mating and enquires if the phenomenon has been hitherto recorded with regard to this group.

As a matter of fact it has been recorded more than once, Riley having

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noted it in America as long ago as 1886 (Science Vol. VIII, p. 326). In a note on the same subject in Insect Life (Vol. V, p. 145, 1893), the same author states :—"It is a well known fact that the male insect of the family Mantidæ approaches the female at the risk of his life." My attention was called to this note in 1905, when I was in Washington, D. C., studying in the laboratories of the Bureau of Entomology. At that time I had a pair of the only American species, *Stagmomantis carotina*, under observation. One day I discovered the pair in coitu and to my astonishment the head, the anterior pair of legs and a goodly portion of the prothorax had already been devoured. The male which seemed in no way inconvenienced remained quietly engaged in the copulatory act, while the female continued her meal. I interrupted the copulation by pulling aside the abdomen of the male with a pair of forceps, but immediately on releasing it it returned to the original position and copulation proceeded as before. I finally killed the pair and preserved them in my collection. Unfortunately in travelling on three continents since that date, these interesting specimens became so damaged as to become useless and had to be thrown away.

LESLIE C. COLEMAN.

BANGALORE, 17*th February*, 1911.

No. XXVII.—A COMMON BLISTER BEETLE (*CANTHARIS ROUXI*, Cast.) AS A NUISANCE TO MAN.

That the blood of the Blister Beetle (Fam. *Cantharidæ*) contains a blistering principle (cantharidin) and that these insects are able to force the blood out through pores situated at the femoro-tibial joints of the legs are well known facts. The blistering power of Indian species seems not to have been at all investigated, and I have been unable to find a record in print of any of these forms causing inconvenience to man.

On the 11th October 1910, I received from Dr. P. Palpu, Deputy Sanitary Commissioner, Mysore, specimens of one of the commonest Indian Blister Beetles (*Cantharis rouxi*, Cast) with the statement that they were swarming into the houses at nights at Harihar, flying to the lights and producing blisters by getting between the clothing and the skin. In response to an inquiry for definite information, the same gentleman stated that, in the early part of October, they had come to lights in the Harihar station in great abundance, and that he had not only examined a number of people on whom blisters had been produced by this beetle, but had also succeeded in producing blisters on his own arm by applying the exuded fluid and leaving it for 8 to 10 hours.

That the above is by no means an isolated case is indicated by the fact that another gentleman has since informed me of a similar experience, although he could not inform me as to the species concerned. It would be

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interesting to ascertain just how common it is, and it suggests a possible economic source for cantharidin and fly blisters in India.

LESLIE C. COLEMAN.

BANGALORE, 17*th February* 1911.

No. XXVIII.—GALLS OF *PARACOPIUM CINGALENSE*, WALK., ON *CLERODENDRON PHLOMIDIS*, LINN. f.

At Agali in the Bhavani Valley, on 21st January 1911, I found a number of deformed flowers on a *Clerodendron phlomidis* bush. On opening these individuals of a *Lygeid* Hemipteron were discovered, which turned out to be *Paracopium cingalense*, Walk. (*vide* Rhynchota, Fauna of British India, Vol. II, p. 128, fig. 92).

The normal flower of *C. phlomidis* has a tubular carolla, with expanded limb, from ¾ to 1 inch long, extruding from a wide campanulate calyx (fig. 1). In the deformed specimens the carolla fails to develop on the ordinary lines, but swells into a globular gall distending the unaltered calyx. The throat remains open, but is blocked by the undeveloped lobes outside (fig. 2), and the rudimentary stamens within. The gall is moderately thick-walled and hollow, no trace of ovary and style being present.

From 1 to 7 live individuals were found in a single gall, all in the same gall being in the same stage of development, but in the several galls all stages of development were to be seen. That the insect reaches maturity before emerging can hardly remain in doubt, seeing that in two cases pairs were detected in copulla within a gall.

The growth of the gall keeps pace with the development of the insects within and remains green till after the latter have matured, when the walls break down or crack through desiccation. In the smallest galls very young wingless nymphs were found and the mature only in the large galls and proportionately with the intermediate sizes and stages.

The rudimentary stamens effectually prevent the egress of the guests until the walls of the gall break down, but apparently permit the entrance of visitors, for occasionally small diptera and lepidopterid larvæ were found within.

When a practical exit was cut in a mature gall, the perfect insects eagerly escaped into the light; in the opposite case, the immature ones sought to conceal themselves in the darker recesses and under the *debris* of cast off integuments.

I could detect no eggs and am unable to suggest where and how these are laid.

No "ambrosia" fungi or other source of food occurs in the lumen of the galls, and it must be presumed, therefore, that the insects feed entirely on juices extracted from the walls of their prison.

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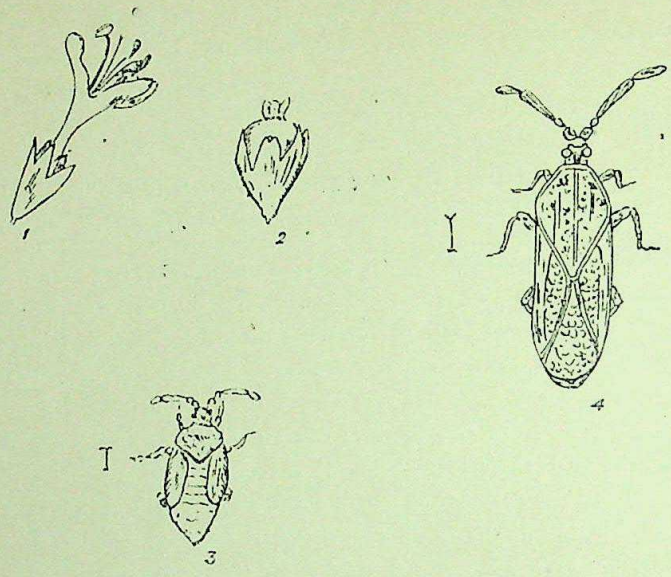

1. Normal flower of *Clerodendron phlomidis* (Nat. size.)
2. Deformed flower of *Clerodendron phlomidis*, Lin f. containing (Nat. size).
3. Nymph of *Paracopium cingalense*, Walk. (much enlarged).
4. Adult *Paracopium cingalense*, Walk. (much enlarged).

The nymphs (fig. 3) before the wings are fully developed are translucent green; just before maturity the insect is very light grey, almost white, and darkens when mature (fig. 4). I omit any further description as that will be found in full on the page quoted above.

COIMBATORE, 19*th February* 1911. C. E. C. FISCHER.

No. XXIX.—NOTE ON THE RATE OF GROWTH OF BARNACLES IN INDIAN SEAS.

Mr. W. S. Millard has submitted to me for examination three large specimens of the Acorn Barnacle (*Balanus tintinnabulum*, Linn.) and has asked me to write a note upon them for the Society's Journal. As the approximate age of these specimens has been ascertained, I avail myself of the opportunity of compiling what is known as regards the rate of growth of barnacles in Indian seas.

It is well known that both Acorn Barnacles (*Operculata*) and the stalked species (*Pedunculata*) are hatched from eggs as minute free-swimming larvæ of the "nauplius" type. After a short period of active life, their form changes and they settle down on some solid object, to which they finally fix themselves, in this position they attain the adult form.

Precise records of the rate of growth of barnacles in Indian seas are few, and even as regards European waters further information of a detailed kind

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is needed. Gruvel, in his "Monographie des Cirrhipèdes," page 426, states that the rate of growth from the fixation of the larva until the attainment of the normal size of the adult, is approximately 1 mm. a day; but it is clear from the observation of others both that the rate of growth is not uniform in different species and under different conditions and that the rate cited by Gruvel is often exceeded. Darwin ("Monograph on the Cirripedia—Balanidæ," page 156, and "Monograph on the Cirripedia-Lepadidæ," page 63) quotes some interesting observations of his own and of other observers made in different latitudes and on different species, and a few notes on the subject may be found in the works of other writers; but as regards Indian seas I have been obliged to rely in compiling this note on observations that have come under my own notice.

As regards Pendunculates from Indian seas, I only know of one precise statement (see "Rec. Ind. Mus." page 295), which was based on an observation made by Dr. J. Travis Jenkins. A clean buoy was moored off the Madras Coast on February 23rd, 1910, and was lifted on March 3rd of the same year. On it were found numerous specimens of *Lepas anserifera* and several of *Conchoderma virgatum* var. *hunteri*. The largest of the former measured 8 mm. in capitular length, and of the latter 15 mm. *L. anserifera* is the commonest non-parasitic Pedunculate in the Bay of Bengal and its larvæ must swarm off the East Coast of India in February, for every piece of driftwood or other floating substance is rapidly covered at that time of year with young barnacles of the species. Hoek ("Siboga-Expeditie," Mon. xxxia (Cirr. Ped.), p. 2) states that in the Malay Archipelago, in which *L. anserifera* (a cosmopolitan species) is also common, specimens with a capitular length of 21mm. were found on the keel of the "Siboga" forty days after the bottom had been cleaned, and that, on another occasion, specimens with a capitular length of 25mm. were found one hundred and seven days after cleaning. The larvæ of the genus *Lepas* do not measure more than 1·5mm. in length at the time of fixation, and I think it is legitimate to assume that the individuals found on the buoy must have settled on it almost as soon as it was put into the water.

The specimens of *Conchoderma* found on the buoy by Dr. Jenkins are the largest examples of the variety to which they belong I have seen. This variety is apparently confined to the Indian Ocean and probably does not attain the same dimensions as the typical form of the species, which is practically cosmopolitan. Darwin states that off the Galapagos Islands certain individuals of the typical form reached a total length of half an inch (*ca.* 11mm.) and became sexually mature in a period of not more than thirty-three days. He gives the length of the larva at the time of fixation as 0·05 inch.

The rate of growth of the Acorn Barnacles does not seem to be quite

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as rapid as that of the stalked forms. Professor Herdman found specimens of *Balanus amphitrite* (perhaps the commonest Indian species) on May 9th on baskets which had been placed in the sea off Galle (Ceylon) on April 17th. These specimens measured from 3 to 8mm. in basal diameter, and some of them were sexually mature (see Herdman's "Report on the Ceylon Pearl Oyster Fisheries," part v, p. 147). *Balanus amphitrite* is a widely distributed species, the size of which varies greatly in different circumstances; on the East Coast of India the basal diameter of fully grown specimens is usually about 14mm. *B. tintinnabulum*, also a common species in all warm seas, usually reaches a larger size than *B. amphitrite*. The base of the largest of the three specimens sent me by Mr. Millard measures 56 × 59mm. These specimens were taken from the bottom of a light-ship in Bombay Harbour and must have been less than nine months old. I have examined another specimen of this species, the base of which measured 60 × 65mm. It was known to be not more than a year old, and was from the Gulf of Manaar ("Mem. As. Soc. Bengal," i, p. 79, footnote). Darwin puts on record a statement that specimens of *B. tintinnabulum*, measuring from 5 to 6 inches in diameter, have been found on ships that had been to sea for not more than a year, while he himself found, on the Coast of Chile, a specimen of a somewhat similar species (*B. psittacus*) that had attained a basal diameter of 1·3 of an inch on a chain that had been six months under water.

These observations, scattered and incomplete as they are, give some idea of the rapid growth of barnacles on ships' bottoms and in similar situations, but valuable observations of a more precise nature might be made without much difficulty in a sea-port provided like Bombay with an extensive harbour.

N. ANNANDALE,
Indian Museum, Calcutta.

December 16th, 1910.

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PROCEEDINGS

OF THE MEETING HELD ON 19TH JANUARY 1911.

A meeting of the members of the Bombay Natural History Society took place on Thursday, 19th January 1911, at the Society's Rooms, Mr. H. M. Phipson presiding.

Mr. R. Gilbert, in proposing that Mr. H. M. Phipson be asked to take the chair, said that it was not often that the Society now had the chance of welcoming one who was one of the founders of the Society, and as Mr. Phipson was only making a short stay in India, they should get all the benefit they could do from his visit. Mr. H. M. Phipson then took the chair amid acclamation.

NEW MEMBERS.

The election of the following 96 new members since the last meeting was duly announced :—

Mr. A. Kirke-Smith (Bombay); Lt.-Col. R. E. Dyer (Multan); Lt. R. B. Seymour Sewell, I.M.S (Calcutta); Mr. W. H. Hunter (Calcutta); Mr. H. W. Oddin Taylor, B.Sc. (Lon.), A.M.I.C.E. (Satara); Major H. Gough, I.A. (Quetta); Mr. A. E. Percy Rae (Rangoon); Mr. M. N. Varvill (Bombay); Mr. D. Clouston (Nagpur); Mr. F. Ludlow (Karachi); Capt. K. G. Gharpurey, I.M.S. (Andheri); Major H. Robinson (Poona); Capt. W. H. Leonard, I.M.S. (Malakand); Mr. B. Gale, I.M.S. (Peshawar); Mr. J. B. Jenkins (Jalgaon); Lt. F. C. L. Grieve (Mhow); Mr. George Girard (Calcutta); Lt. C. M. Maltby (Upper Topa); Capt. W. B. Spalding (Cawnpore); Mr. A. A. Lane Roberts, I.C.S. (Kulu Punjab); Mr. S. R. Perfect (Karachi); Mr. H. R. Blunt (Kashmir); Lt. A. J. Lee, I.M.S. (Delhi); Capt. G. W. Hay (Europe); Capt. E. Burd, I.A. (Rangoon); Mr. Hugh Whistler (Rawalpindi); Mr. J. C. Higgins, I.C.S. (Assam); Capt. H. D. Henderson (Manipur); Capt. B. Fagan (Manipur); Mr. F. M. Dowley (Bezwada); Capt. W. G. B. Hawley (Multan); Mr. R. C. Rilley (Kandri *via* Kamptee); Mr. R. N. H. Reid (Coorg); Lt. B. C. T. Paget (Wellington, Nilgiris); Mr. J. S. Wilkes (Russellkonda, Ganjam); Mr. W. R. Shelton (Agar, Burma); The Secretary, Flyfishers' Club (36, Piccadilly, London W.); Mr. F. von Bock (Jacobabad, Sind); Mr. H. A. Inglis (Anarh, Leberia Sarai P.O.); Mr. R. V. Gregory (Purna, Deccan); Mr. A. C. Duff, I.C.S. (Russellkonda, Ganjam); Mr. C. C. Wilson (Coimbatore); Mr. E. M. F. Nicholson (Bombay); Major A. M. Fleming, I.M.S. (Raipur); Mr. W. T. N. Ryan (England); Major W. Selby, D.S.O., F.R.C.S., I.M.S. (Lucknow); Mr. N. Calder (Lucknow); Mr. C. H. K. Chamen (Hyderabad, Deccan); Mr. J. F. Keddie (Raheng, Siam); Major Lowther (Bolarum, Deccan); Mr. Colin R. White (Trichinopoly); The Mess Secretary, 18th Infantry (Ferozepore);

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Mr. K. Hacker (Mandalay, Burma); Lt. A. H. P. Cruickshank (Lahore Cantonment); Mr. J. A. Brandon (Bombay); Lt.-Col. J. Farmer (Punjab); Mr. M. Wall (Punjab); Capt. G. F. S. Routh (Meerut); Mr. W. Mayes (Lahore); Mr. H. G. Young (Ferozepore); Mr. P. E. Gourju (Berhampore); Mr. N. F. Peck, I.C.S. (Chittagong); Rev. E. Gombert, S.J. (Trichinopoly); Mr. N. Gupta, Bar.-at-law (Dacca); Mr. C. C. Lumley (Decca); Mr. J. L. Remington (Bandikui); Mr. E. Boothe (Bombay); Rev. E. E. Hill, M.A. (Satara); Mr. W. E. C. Johnson (Assam); Capt. L. C. Taullier (Bombay); Mr. J. F. Blackwood (Jalpaiguri); Mr. K. L. Gordon (Ceylon); Mr. R. C. Dodson (Sialkot); Mr. A. K. Digby (Rawalpindi); Prof. R. S. C. Brown, B. Sc. (Poona); Rev. Father Joseph Asmuth, S.J. (Bombay); Mr. F. B. Wilkins (Dacca); Mr. C. F. Coates (Lakon, U. Siam); Mr. D. Aitchison (Madras); Mr. E. S. Pinfold, B.A. (Rangoon); Capt. A. M. Addison (Rawalpindi); Lt. H. G. Martin (Rawalpindi); Lt.-Comdr. The Hon'ble R. O. B. Bridgeman, H. M. S "Redbreast" (Bombay); Mr. E. T.C. Farr (Ceylon); Capt. W. F. Reichwald (Mhow); Lt. The Hon'ble H. G. O. Bridgemen, R. H. A. (Rawalpindi); Mr. A. A. L. Parson, C.S. (Patiala, Punjab); Mr. R. C. Bolster, I.C.S. (Dera Ghazi Khan); Mr. J. H. Luke (Narayanganj); Mr. A. H. Ley, I.C.S. (Calcutta); Mr. I. M. Cameron (Bagaha P.O., Champaram, Bengal); Mr. H. F. Treeby (Ambala); Mr. F. C. Fowle (Bombay); Capt. G. N. Reynolds (Saugor); The Mess President, 52nd Sikhs (F.F.) (Peshawar); and Capt. Boxwell (Bangalore).

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following contributions to the Museum, since the last meeting:—

Contribution.	Locality.	Donor.
Young Leopard Cat (*Felis bengalensis*). Himalayan Palm Civet (*Paradoxurus niger*). Small Shrew and a Mrs. Hume's Pheasant (*Phasianus humiæ.*)	Haka, Chin Hills.	Capt. F. E. W. Venning.
Several Jackals, Foxes, Desert and Jungle Cats, Mice, Squirrels and Hedgehogs.	Thar and Parkar, District, Sind.	Mr. E. Priestley, D.S.P.
1 Stoat (*Mustela whitheadi*) ? ...	Chitral ..	Major F. Wall, I.M.S.
2 Wild Dog (*Cyon dukhunensis*) Skins.	Kadra, Kanara ..	Mr. W. A. H. Miller, I.F.S.
4 Bats, 3 Rats and a Squirrel ...	Kurseong, Darjeeling.	Mr. E. A. D'Abreû.
1 Marmot, 2 Mouse Hares and 1 Vole.	Baltistan ..	Mr. A. S. Brooke.
1 Bamboo Rat (*Rhizomys badius*) ...	Jalpaiguri ..	Mr. A. Field.
Markhor (*Capra falconeri*) head ...	Chitral ..	Mehtah of Chitral.
Arabian Thar (*Hemitragus jayakari*) Skin with horns.	Muscat ..	Capt. Hunt, R.N., C.I.E.

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Contribution.	Locality.	Donor.
Pair of Sambar horns (*Cervus unicolor*).	Kurnool ..	Mr. B. H. Barlow Poole.
Shou (*Cervus affinis*) head	Tibet ..	Through Col. Manners Smith.
5 Bird Skins	Baltistan ..	Capt. F. L. Hughes.
35 Bird Skins	Garhwal ..	Mr. S. L Whymper.
Great Snipe (*Gallinago major*) ...	Bangalore ..	Capt. Boxwell.
3 Solitary Snipe (*Gallinago solitaria*).	Chitral .	Capt. Lyall.
Wood Snipe (*Gallinago memoricola*) ..	Almora ..	Major F. Wall, I.M.S.
Pintail Snipe (*Gallinago stenura*) (variety).	Bhandup .	Mr. J. L. Symons.
Curlew (*Numenius arquata*)	Panvel ..	Mr. P. M. D Sanderson.
Scimitar Babbler (*Pomatorkinus erythrogenys*	Simla ..	Mr. P. T. L. Dodsworth.
Marbled Teal (*Marmaronetta angustirostris.*)	Ferozepore ..	Mr. A. S. Brooke
1 Bittern (*Botaurus stellaris*) ...	Agra District ..	Mr. C. A. Cooke.
2 Swan (*Cygnus musicus*) heads ...	Bannu ..	Major H. A. F. Magrath.
1 Whooper's Swan (*Cygnus musicus*) .	Campbellpore ..	Lt. Hornsby.
1 Bewick's Swan (*Cygnus bewicki*) ...	Marden, N.-W F. P.	Major H. W. Codrington.
2 Golden-eyed Duck (*Clangula glaucion*).	Jhelum ..	Lt. G H. Dempster.
Stiff-tailed Duck (*Erismatura leucocephala*).	Kohat ..	Lt. W. H. Logan Home
Smew (*Mergus albellus*)	Bhadarwa ..	Mr H. Vernon Purkis.
Little Bustard (*Otis tetrax*)	Kashmir ..	Mr. F. J Mitchell.
European Great Bustard (*Otis tarda.*)	Jacobabad ..	Capt. M H. Simonds.
5 Great Indian Bustards (*Eupodotis edwardsi*).	Thar and Parker District, Sind.	Mr E. Priestley.
3 Houbaras (*Houbara macqueeni*) ...	Do. ..	Do.
8 Bengal Floricans (*Sypheotis bengalensis*).	Do. ..	Mr E. C Stuart Baker.
A number of Duck, &c.	Pithoro, Sind ..	Messrs. J. E C. Jukes, G. M. Lane, C O Lowsley and C. W. Arbuthnot.
274 Birds Eggs of 50 species	Assam ..	Mr. E. C. Stuart Baker
3 Eggs of Indian Plantive Cuckoo (*Caccomantis passerinus.*)	Hyderabad ..	Prof. K. Burnett.
A large number of Snakes and Lizards.	Various localities	Major F. Wall, I.M.S.
25 Frogs and Toads, 20 Lizards, 3 Salamanders, several Centipeds, etc.	Kurseong ..	Mr. E. A. D'Abreu.
10 Frogs	Neliput Hills, S. India.	Mr. A. M. Kinloch.
Zamenis gemonensis	Muhammerah, Persian Gulf.	Lt A. T. Wilson
Krait (*Bungarus cœruleus*) and Brown Tree Snakes (*Dipsadomorphus trigonatus*).	Bhuj, Cutch ..	Mr. J. H. Smith.
King Cobra (*Naia bungarus*)... ...	S. Lushai Hills ..	Mr J Masters
Burmese Krait (*Bungarus magnimaculatus*).	Shewbo, Burma. .	Lt.-Col. F. J. Dewes, I M. S.
Several Snakes	Rajputana .	Mr. H. N. Coleman.
42 Snakes and 184 Lizards	Thar and Parke District. .	Mr. E Priestley.

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Contribution.	Lecality.	Donor.
1 Snake and several Insects	Ootacamund ..	Mrs. Millard.
Some Fresh Water Fishes, Frogs and Crabs.	Goa ..	Mr. P. F. Gomes.
A small collection of Butterflies ...	Kulu ..	Mr. H. Whistler.
12 Butterflies	Pachmahri ..	Capt. G. H. Evans.
1 Meteorite	Kotteir, Punjab. .	General W. Osborn.

Minor contributions from :—Major W. H. Kendrick, Major C. H. Ward Messrs. J. H. Skelton, G. D. Ommanney, E. C. Stuart Baker, G. M. Ryan, A. H. Marshall, W. Palmer, L. Newcome, A. Marshall, B. N. Mundy and Jaber Ali.

A WHALE AT VIZIADRUG.

The Honorary Secretary said that the Society received information from Mr. A. Wood, I.C.S., Collector of Salt Revenue, on the 11th instant, that a large whale had been washed ashore on the rocks about 2½ miles from Viziadrug Customs House (Ratnagiri District). The Society at once sent off a man to try and measure and obtain some information about the external characters, which are still unknown, of the Indian Fin-Whales, but unfortunately it was too late and the specimen had been broken to pieces by the sea.

From the information gained on the spot the whale measured about 70 feet in length, and was, therefore, probably a specimen of the Great Indian Fin-whale (*Balænoptera indica*). It was apparently stranded on the 6th instant, and if only telegraphic information had been sent immediately to the Society, it might have been possible to have obtained some valuable information and notes on the subject. This was the second large whale which had been washed up on the Bombay coast during the last 5 years, and unfortunately they were still without any information as to the external characters of the Indian Fin-Whales.

SPECIAL APPEAL FOR THE COLLECTION OF MAMMALS.

The Honorary Secretay then drew the attention of members to the urgent need of good specimens of Indian mammals, in which not only the Society itself, but even the South Kensington Natural History Museum, London is more deficient than is generally realised.

He considered the question of such importance and he felt sure that in this he had the support of all those interested in Natural History, that he had drawn up a special appeal for funds to meet the expenses of two trained collectors, whom it was proposed to bring out from home, to collect Indian mammals for the Society.

This would be the first real attempt to collect mammals in India, which as far as he knew had never before been systematically worked.

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This appeal, he was glad to say, had met with a response, which, seeing that the list was open only a week ago, might be considered encouraging.

All subscriptions would be acknowledged in the Society's Journal, and subscribers would be informed from time to time of the progress made in carrying out this important work.

He appealed not only to members of the Bombay Natural History Society, but also to any one interested in Natural History, who would recognise that a work of this kind was not only of value to Science, but of interest to themselves; in that it supplied a want which was keenly felt even in the premier Museums of the world.

This was, he said, the first appeal for funds which the Society had made since its foundation in 1883, for any of its various enterprises in Natural History, and, therefore, it was hoped that it would meet with the response it deserved.

A MARINE AQUARIUM.

The Honorary Secretary said that during a recent visit to Madras, he had the opportunity of inspecting the Marine Aquarium and it so impressed him with its excellence that it occurred to him that members of the Bombay Natural History Society might care to hear some details about it, and possibly by bringing it before the notice of the public, the description of it might influence some local benefactor to give to Bombay a similar institution which would prove to be both popular and of educational importance.

The Marine Aquarium, at Madras, was the first institution of its kind in India, if not the first in the tropics. It owes its inception to Lord Ampthill, who, while Governor of Madras, drew up in conjunction with Mr. Edgar Thurston, Superintendent of the Madras Museum, the first rough plan of a public Aquarium. It was constructed in 1908, by the Government of Madras, at a cost of about Rs. 15,000, the object being for Educational and Scientific purposes and an annexe to the Presidency College and also for the general public.

The building is a low, unpretentious brick edifice and is situated on the seaward side of the famed Madras Marine, less than a hundred yards from the sea. The site is very similar to that of Chowpatty. The main entrance leads into a large paved area with a central fresh-water pond and fountain, and on either side are five tanks with plate-glass fronts, lit from above, each measuring $7 \times 3 \times 3\frac{1}{2}$ feet. The entire seaward side of the central area is occupied by a large open tank at present stocked with turtles (*Chelone mydas*). On either side of the entrance passage are two rooms designed for Committee meetings, storage of materials, etc., and one of them is at present occupied by the aeration plant.

With the exception of two tanks for fresh water fish (at present containing species of *Megalops*, *Ophiocephalus*, *Notopterus*, etc.,) which are

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oxygenated by living *Vallisneria*, the remaining eight tanks contain salt water, which circulates from tank to tank and in addition are supplied with air from two compression cylinders, forced into each tank through a Berkfield filter candle. At present the cylinders are filled by hand pumps, but the use of an oil engine is contemplated. Seawater is conveyed to a covered well in the rear of the Aquarium along a pipe filled by hand at the seaward end. From the well it is pumped into filter beds, and from these passes to large elevated cisterns, whence it is distributed to the tanks. The shore water on the Madras Coast is so disturbed by the surf that this filteration is unavoidable at present, though the removal thereby of small organisms is undoubtedly a drawback. The water which has circulated through the Aquarium tanks can, if desired, be brought back to the filter beds and used a second time.

The Director of the Aquarium is the Superintendent of the Madras Museum, and he is assisted by a small local Committee.

The number of visitors at first was something like 1,100 a day and even now some 400 to 600 persons a day visit the Aquarium. A small admission fee is charged (½ an anna) and one day in the week is reserved for the upper classes who pay 4 annas each, and one day is reserved for purdah ladies. The number of visitors from 21st October 1909 to 31st March 1910, was 100,463 and the amount realised in admission fees was Rs. 3,330-4-6. The largest number of visitors on a single day was 3,436.

The staff consists of 3 keepers, 2 door-keepers and coolies costing about Rs. 100 per mensem, so that at present it may be considered as self-supporting.

The magnificent colours and wonderful shapes of many of the fish form a most attractive display. The exhibits include Sea-snakes (*Enhydrina* and species of *Distira*) and among the fish species of the following:—

Ginglymostoma, Stegostoma (Tiger sharks), Chiloscyllium, Muræna (Eels), Arius, Therapon Serranus, Lutjanus, Myripristis, Trachynotus, Pterois, Caranx, Antennarius, Heniochus, Julis, Teuthis, Balistes, and Tetrodon. The invertebrates comprise cuttle fish, holothurians, hermit crabs (Clibanarius), swimming crabs (Scylla and Neptunus), lobsters (Panulirus), prawns (Penæus), etc.

All the specimens had been taken on the Madras Coast within a few miles of the Aquarium.

Fish are brought in by paid fishermen who, however, will not bring in live edible fish. Rs. 5 has been offered for a live pomfret without success and none of the common edible fish appear to be procurable.

Feeding.—Owing to the fact of the water being filtered artificial food has to be supplied and lumps of raw fish are given every afternoon.

Many of the details given here were kindly sent him by Professor P. F. Fyson of the Presidency College, Madras, who also forwarded some rough

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colour sketches of the fish which had been enlarged by Miss G. Millard. Other technical details were obtained from an account of the Aquarium written by Dr. J. P. Henderson, which was published in *Nature* in February last.

The photographs would also enable members to gain some idea of the general appearance of the Aquarium and also of the interior.

In conclusion the Secretary asked "Is it too much to hope that some public spirited citizen will come forward and enable Bombay to follow the execellent example which Madras has set us?"

There could, he thought, be no doubt that such an Aquarium in Bombay would be both popular and of great educational value.

Professor Powell said it would be difficult to exaggerate the importance of such an Aquarium as an educational factor. No progress in the study of practical Biology can be expected till such an Aquarium is available for teachers, students and those engaged in original research on Biological problems. He would venture to say that ninety per cent. of our University graduates in Biology had never seen or handled a Sea Urchin, Star Fish, Jelly Fish, or Lancelet, though they possibly write glib polysyllabic accounts of their structure, development and life-histories. Such "learning" obtained from text-books is not science. At present the Bombay student of Natural Science learns it in exactly the same way as he learns history from text-book. He knows not science but the "history of science." He can tell you what Huxley, or Darwin, or De Vries has observed as he can tell you how Napoleon or Hannibal has fought. He has made no personal observations or experiments, but with an Aquarium at hand to supply our colleges with Biological material this state of affairs can be remedied, not otherwise.

SMALL GAME SHOOTING IN SIND.

An interesting paper on this subject was read by Mr. N. B. Kinnear, who gave his experiences of a three weeks' shoot in December with Mr. E. Priestley, D.S.P., a member of the Society, in Lower Sind.

OF THE MEETING HELD ON 2ND FEBRUARY 1911.

A meeting of the members of the Bombay Natural History Society took place on Thursday, 2nd February 1911, at 6-15 p.m., at the Society's Rooms, H. E. Admiral Sir Edward Slade, M.V.O., presiding.

NEW MEMBERS.

The election of the following 5 new members since the last meeting was duly announced:—

Mr. E. B. M. Bulkely (Sabathu); Capt. H. C. H. O'Brien (Nowshera); Lt.-Col. A. L. Duke, M.B. (Quetta); the Hon'ble Mr. W. Fraser (Cawnpore) and the Mess Secretary, 45th Sikhs (Nasirabad).

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ACCOUNTS FOR 1910.

The Honorary Treasurer, Mr. L. H. Savile, presented the Statement of Accounts for 1910, which, he remarked, continue to show fairly satisfactory results. The subscriptions received during the year amounted to Rs. 22,872-15-10, which included Rs. 827-10-0 for subscriptions in arrears and Rs. 3,089-9-4 for subscriptions for 1911 and 1912 paid in advance.

The entrance fees amounted to Rs. 2,690, which is slightly less than last year. 285 new members were elected as compared with 294 in 1909.

It was resolved that the accounts be passed subject to the usual audit and a vote of thanks was passed to Mr. Savile, the Honorary Treasurer.

ELECTION OF THE COMMITTEE.

The following gentlemen were elected as office-bearers for the present year:—

President, H. E. the Right Hon'ble Sir George Sydenham Clarke, G.C.M.G., G.C.I.E., F.R.S.; Vice-Presidents, Mr. J. D. Inverarity, B.A., LL.B., Rev. F. Dreckmann, S.J., and the Hon'ble Mr. Justice N. C. Macleod; Honorary Secretary, Mr. W. S. Millard; Honorary Treasurer, Mr. L. H. Savile; Honorary Librarian, Mr. T. M. S. Culbertson; Managing Committee, Mr. E. C. Stuart Baker, F.Z.S., Lt.-Col. W. B. Bannerman, M.S., Mr. T. R. Bell, I.F.S., Mr. C. L. Burns, Mr. E. Comber, F.Z.S., Vet.-Col. G. H. Evans, Prof. G. A. Gammie, Mr. E. Ernest Green, F.E.S., Mr. N. B. Kinnear, Lt.-Col. K. R. Kirtikar, I.M.S. (Retd.), Mr. J. McNeill, I.C.S., Lt.-Col. A. Newnham, F.Z.S., Dr. A. Powell, Mr. G.M. Ryan, I.F.S., Major F. Wall, I.M.S., C.M.Z.S., Mr. John Wallace, C.E., and Captain W. H. Evans, R.E.

APPEAL FOR FUND FOR MAMMAL COLLECTION.

The Secretary said that although some members had kindly subscribed to the Society's appeal for funds to enable them to make a collection of mammals, he hoped that many more would send in subscriptions. If each member gave Rs. 10 only per annum for two years the whole amount would be subscribed as the Society had more than 1,500 members. One member had promised to subscribe Rs. 10 per mensem until further notice and such help was greatly appreciated. One of the original objects of the Society was the promotion of the study of Zoology, and therefore he hoped that by the next meeting he would be in a position to announce many more subscriptions.

PAPER READ.

Mr. H. Maxwell Lefroy, Imperial Entomologist to the Government of India, then read a paper on "The Progress of Entomology in India." The paper will be published in the Society's Journal. The meeting then terminated with a vote of thanks to Mr. Lefroy for his interesting paper.

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OF THE MEETING HELD ON 9TH MARCH 1911.

A meeting of the members of the Bombay Natural History Society took place on Thursday, the 9th March 1911, at the Society's Rooms, the Hon. Mr. R. A. Lamb, I.C.S., C.I.E., C.S.I., presiding.

The election of the following 23 new members since the last meeting was duly announced :—

Mr. F. Ware (Madras); Mr. M. P. Thomas (Danpur); Mr. T. Cooper (Abu Road); Mr. K. W. Barlee, I.C.S. (Bombay); Maharaj Kunwar Major Dowlatsing (Idar, Mahi Kantha); Mr. G. F. W. Elwes (Europe); Mr. R. G. Abbott (Bombay); Mr. C. D. Donald (Rangoon); Mr. G. B. Scott (Ahwaz P. O., *via* Persian Gulf); Capt. R. B. Worgan (Madras); Capt. C. A. Godson, I.M.S. (Assam); Mr. H. N. Colan (Jodhpur, Rajputana); Mr. J. V. Collier, I.F.S. (Ramnagar); Mr. J. H. Lyall, I.F.S. (Haldwani); Mr. J. N. Oliphant (Kheri, Oudh); Mr. H. E. Wells, M.B. (Minbu); Mr. F. R. R. Rudman, I.C.S. (Jubbulpore, C.P.); Dr. A. J. M. Paget, M.D. (Berbera, Somaliland); Mr. L. Volkart (Bombay); Mr. W. Reinhart (Bombay); Mr. A. C. Hiley (Belgaum); Mr. R. W. Inder (Belgaum) and Mrs. Mary H. Nichol (Selangor).

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following contributions to the Museum since the last meeting :—

Contribution.	Locality.	Donor
Jackal (*Canis aureus*) Skin	Thana Dist. ...	Mr. E. G. L. Laird MacGregor, I.C.S.
Four-horned Antelope (*Tetracerus quadricornis*).	Do. ...	Do.
Head Skins of Indian Gazelle (*Gazella bennetti*) and Black Buck (*Antilope cervicapra.*)	Okhamandal ...	Capt. A. H. E. Mosse, I.A.
Shed Antler of Shou (*Cervus affinis*).	Chambi Valley ...	Major Barclay.
7 Mammal Skins	China ...	Trustees of British Museum.
Pallas's Squirrel (*Sciurus erythræus*).	Shillong ...	Major Wilson.
Stone Curlew (*Œdicnemus scolopax*).	Karjat ...	Mr. J. Black.
Grey Partridge (*Francolinus pondicerianus*) (variety).	Fort Munro ...	Mr. F. J. Mitchell.
Stiff-tailed Duck (*Erismatura leucocephala*).	Jhelum Dist. ...	Capt. F. L. Hughes.
Golden Eye (*Clangula glaucion*) ...	Roorkee ...	Major A. H. Cunningham, R.E.
Whooper Swan (*Cygnus musicus*) ...	Sohan, R. Punjab.	Lt. P. L. Orde.
Whooper (*Cygnus musicus*) head and feet.	Lahore ...	Mr. L. C Glasscoke.
White-winged Wood Duck (*Asarcornis scutulatus*).	Burma ...	Mr. W. O. Hannyington.
1 Spur (*Galloperdix spadacea*) and 1 Grey Jungle Fowl (*Gallus sonnerati*).	Khandesh ...	Lt.-Commdr. Hon'ble R. O. B. Bridgeman.

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Contribution.	Locality.	Donor.
12 Fishes	Madras ...	Prof. P. F. Fyson.
1 Snake (*Eryx johnii*)...	Bombay ...	Mr. C. N Robinson.
Several Butterflies	Hyderabad, Sind.	Capt F. C. Fraser.
A number of Beetles	Various ...	Lt. H. G. Chippindall.
Sponges and Crustaceans	Do. ..	Indian Museum.

Minor Contributions to the Museum from :—Lt. A. Wilson, Messrs. R. Gilbert, H. E. Standage, L. H. Savile, C. Lowsley, C. B. Antram and A. Dunbar Brander.

INDIAN MAMMAL SURVEY.

The Secretary said that the members who had subscribed would doubtless like to know how this was progressing. So far the Society had received some Rs. 3,000, but in addition to this His Highness the Maharaja Scindia had kindly promised Rs. 2,000 as a first donation and H. H. the Gaekwar of Baroda Rs. 500, so that the total received and promised up to date was over Rs. 5,000.

The first collector, Mr. C. A. Crump, had already started work in East Khandesh, where Mr. A. H. A. Simcox, I.C.S., the Collector of this District, had kindly offered to help him, and it was proposed that he should work eastwards from Khandesh—south of the Nerbudda towards Jubbulpore.

As to whether the Society would be able to employ a second man depended entirely on the members themselves. It would of course take many years for one man to cover the whole of India, Burma and Ceylon, but the Society would not feel justified in employing another collector until the sum of Rs. 15,000 at least was received and a similar amount would be required the following year.

One member (Mr. Lowndes) had kindly presented them with all his camp kit in addition to a handsome subscription, and the Secretary once again emphasized the fact that if only each member would give Rs. 10 the amount would be subscribed.

He should mention that H. E. Sir George Clarke, F.R.S., who was President of the Society, in forwarding a cheque for Rs. 100 towards the object of the appeal wrote, "I have seen your appeal for funds to make a systematic collection of mammals of India. I did not realize that existing specimens were so inadequate and I cordially agree with you that an effort should be made to improve it."

The Chairman said he hoped that all members would respond to the appeal. Some people, he believed, considered that it was the duty of Government to do such work, but he was unable to concur in that view. The

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benefits to be derived from the Survey, however great they may be to Science, are not sufficiently connected with Government administration in any of its branches to justify the expenditure on it of public funds.

PAPER READ.

The following paper was then read "On the improvement in the yield and quality of Indian wheat with an exhibit of the new wheats obtained at Pusa by selection and hybridisation, by Mr. Albert Howard, Economic Botanist to the Government of India, and Mrs. Gabrielle L. C. Howard, Personal Assistant to the Imperial Economic Botanist.

Most of the merchants interested in the wheat trade attended and there was an exhibit of the new Pusa wheats which have been obtained by selection and hybridisation. By adopting these modern methods of improvement new Indian wheats have been produced of the same grain quality as American and Canadian Spring wheats which now command the highest prices on the English market. These new wheats are far superior in milling and baking qualities to the average Indian wheat exported from the country and it is expected that they will soon be grown on a sufficient scale to influence the trade.

In addition to quality, great improvements have also been made in the production of wheat. New methods of cultivation and soil management have been devised by which crops of over 2,500 lbs. of wheat to the acre have been grown continuously on the same land without manure and without irrigation water or rain after sowing time. Such yields were not considered possible in India under dry farming conditions, but they have been obtained at Pusa using only the means at the command of ordinary cultivator.

The paper in question will be printed in full in a forthcoming issue of the Journal of the Bombay Natural History Society.

OF THE MEETING HELD ON 11TH APRIL 1911.

A meeting of the members of the Bombay Natural History Society took place on Tuesday, the 11th April 1911, at the Society's Rooms, Lieut.-Colonel W. B. Bannerman presiding.

The election of the following 15 new Members since the last meeting was duly announced :—

Mr. Gulabrai Bhawandas (Shewan, Sind); Mr. P. Vlasto (Bombay); Lt J. Wolfe Murray, R.N. (Bombay); Mr. A. R. Villar (Tharrawaddy, L. Burma); Mr. R. E. Macpherson (Sholapur); Lt.-Col. H. Fooks, I.M.S. (Risalpur, N.-W. F.P.); Mr. Freeman Roper (England); Mr. C. P. G. Jones (Sinbo, Burma); Mr. E. H. Burt (Bombay); Lt. C. B. Evans, R.N. (Bombay); Mr. A. Barnes (Rutlam); Shrimant Chintamanrao Appasaheb Patwardhan, Chief of Sangli (Sangli, S.M.C.); Mr. W. E. Beazley (Malakand); and Mr. N. H. Deane (Rangoon, Burma).

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CONTRIBUTIONS TO THE MUSEUM.

Mr. N. B. Kinnear, in the absence of the Honorary Secretary, acknowledged the following contributions to the Museum since the last meeting :—

Contribution.	Locality.	Donor.
2 Markhor Masks (*Capra falconepi*)	Chitral ...	Capt R. A. Lyall.
2 Muntjac heads (*Cervulus muntjac.*)	Kangra Dist. ...	Genl. W. Osborn.
2 Pine Martens (*Martes flavigula*) ..	Chitral ...	Cap. R. A. Lyall.
1 Flying Squirrel (*Sciuropterus fimbriatus*).	Do. ...	Do.
1 Large Brown Flying Squirrel (*Pteromys oral*).	Almora ...	Major F. Wall, I.M.S
2 Indian Desert Gerbilles (*Tatera hurrianæ*).	Sibi, Baluchistan.	Major C. Ward.
2 Afghan Gerbilles (*Tatera erythrura*).	Do. ...	Do.
1 Shrew	Dehra Dun ...	Major H. Fulton.
1 Wing of European Bustard (*Otis tarda*).	Risalpur ...	Col. H. Fooks, I.M.S.
1 Head of Mute Swan (*Cygnus olor*).	Nowshera ..	Capt. H. O'Brien.
2 White-winged Wood Ducks (*Asarcornis scutulatus*).	Shwebo ...	Mr. W. O. Hannyngton.
1 Himalayan Pied Kingfisher (*Ceryle lugubris*).	Almora ...	Major F. Wall, I.M.S.
1 Solitary Snipe (*Galinago solitaria*).	Do. ...	Do.
1 Golden Eye (*Clangula glaucion*)...	Jhelum ...	Mr. F. L. Hughes.
3 Grey Partridges (*Francolinus pondicerianus*).	Mekran Coast ...	Capt. A. Hunt, R. N.
1 Reed Bunting (*Emberiza schœniclus*).	Rawalpindi ...	Mr. H. Whistler.
4 Spotted Wings (*Psaroglossa spiloptera*).	Dehra Dun ...	Major H. T. Fulton.
2 Eggs of Sandgrouse (*Pterocluru exustus*).	Orcha ...	H. H. Maharaja of Orchha.
1 Python (*Python molurus*) (alive).	Wardha ...	Mr. P. S. Patuck, I.C.S.
1 Burmese Krait (*Bungarus magnimaculatus*).	Minbu, Burma ...	Major F. Wall, I.M.S.
5 *Typholps brahminus* (juv) ...	Assam ...	Do.
1 Cobra (*Naia tripudians*)	Palli Hill, Bandra	Col. J. Forbes.
1 Green Whip Snakes (*Dryophis mycterizans*).	Do. ...	Mr. J. Brikett.
1 *Simotes arnensis*	Thana ...	Mr. H. Bulkley.
1 Phoorsa (*Echis carinata*). ...	Cutch ...	Mr. J. H. Smith.
9 Fishes, 7 Crabs, 1 Lizard	Karwar ...	Mr. P. Gerhardt.

INDIAN MAMMAL SURVEY.

The Secretary announced that since the last meeting of the Society he had received some Rs. 6,500 making the total subscription up-to-date about Rs. 10,000. Among the principal contributors were H. H. the Maharaja Scindia, Rs. 2,000 (which was mentioned at last Meeting), the Hon. N. C. Rothschild, Rs. 1,500, H. H. the Rao of Cutch, Rs. 1,000 and H. H. the Maharaja of Mysore, Rs. 1,000. The Society's collector, Mr. Crump, was still in Khandesh working eastwards towards the Berar, from where it

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